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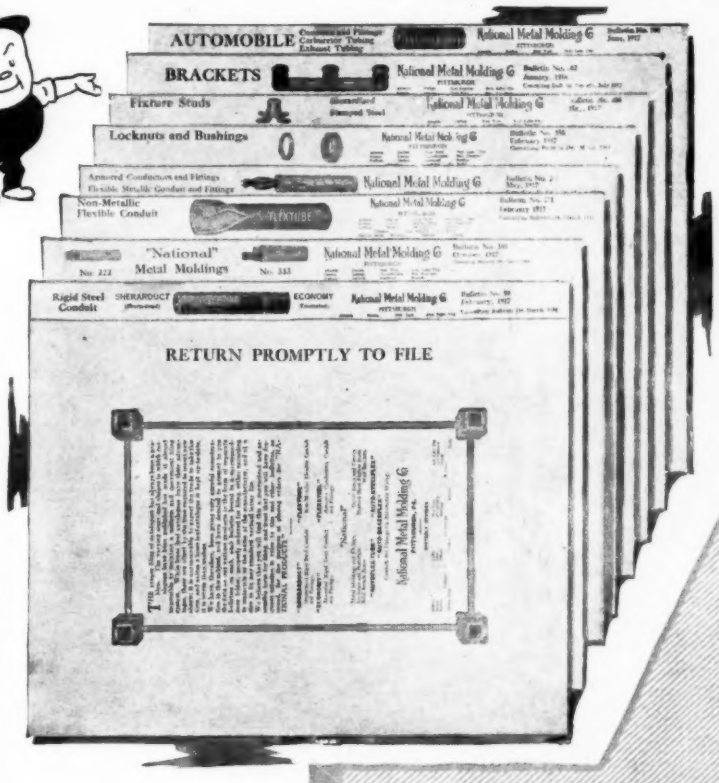

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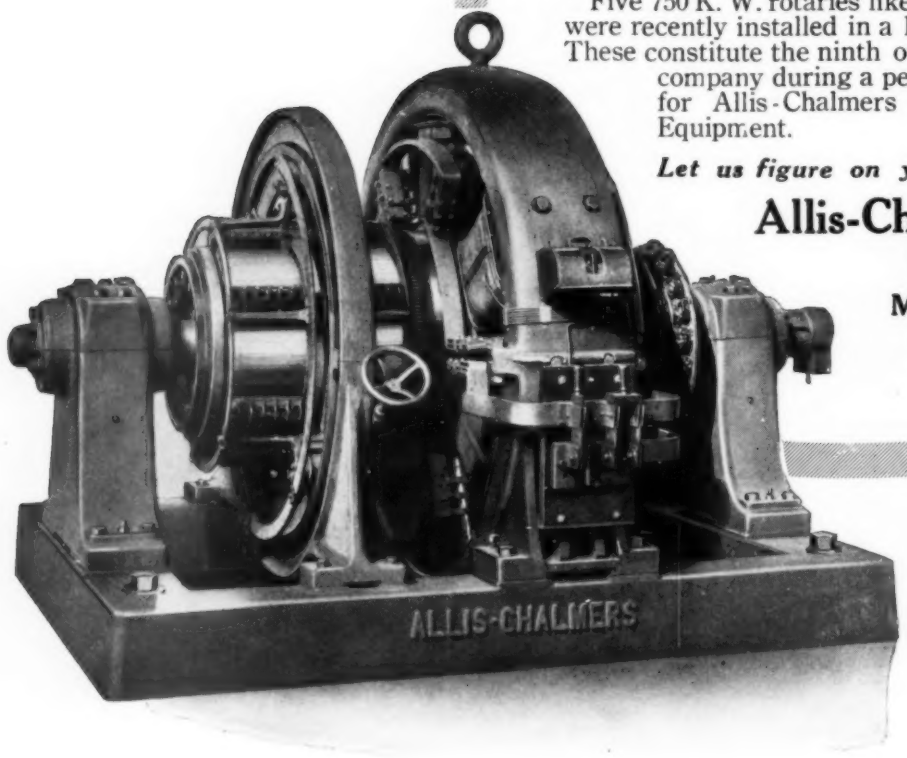


ALLIS-CHALMERS

Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

VOL. 74.—No. 12. CHICAGO, SATURDAY, MARCH 22, 1919. PAGE 449.

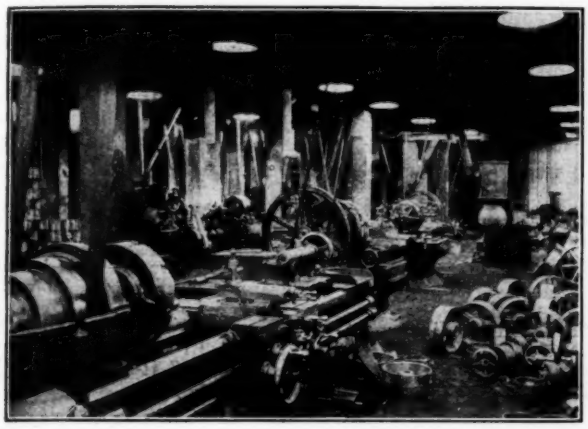


Fig. 1.—View in Pulley-Finishing Shop With Modernuized Lighting.

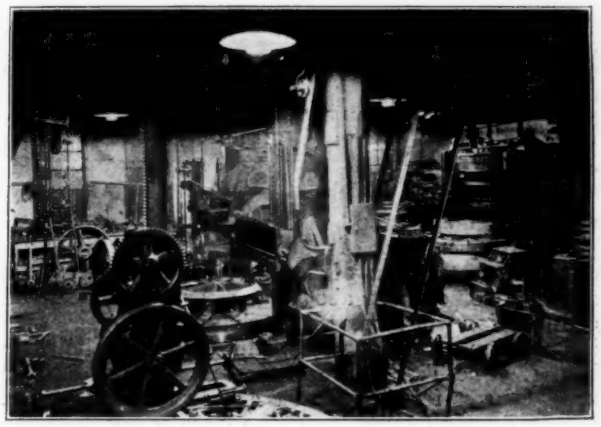


Fig. 2.—Soft-Metal-Bearing Shop Illuminated to Productive Lighting Intensity.

Four Conclusive Tests of Productive Value of Good Factory Lighting

Details of Tests Conducted by Testing Department of Commonwealth Edison Company in Four Chicago Shops —Average Increase of Production Ranges from 10 to 20%

ADVOCATES of improved industrial lighting have for some years pointed out that among the marked benefits resulting from its adoption is the increase of production it brings about. This is a very telling point in inducing the factory owner or manager to become sufficiently interested in the lighting problem to order installation of an up-to-date lighting system. A great many factory executives are very conservative, however, and, like the man from Missouri, they want to be shown. The question, then, is, how can this emphatic and clear argument be definitely brought home to them in the best way?

The answer has usually been that specific figures showing at least approximately what increase in production would result from lighting betterment were desirable, if not actually necessary. Foreseeing the value of such figures, a number of tests of production increase following lighting improvement have been made in several cities, but in no case had the matter been given consistent and persistent study up to within a year and the results announced from various tests have seldom included a full statement of the conditions under which the tests were made.

In Chicago four tests of the relation of lighting to production have been made during the past year that have aroused the greatest interest because of the care with which they were conducted and the conclusiveness of their results. Although some of these tests have been referred to on several occasions, it was only a few weeks ago that a complete review and summary of the four tests was made before the Chicago Section of the Illuminating Engineering Society in a paper entitled "Lighting for Production," presented by W. A. Durgin. These tests were conducted by the Testing Department of the Commonwealth Edison Co. and formed an important feature in a general shop lighting survey undertaken by this progressive central-station company of the plants of the larger manufacturers served from its lines. Before advising greater use of light it was felt desirable to know the actual facts, to ascertain which the Chicago company undertook a series of tests to show the true relation between the amount of light used and the production of hand and machine workmen in various industries. The conditions to be met in the conduct of the tests were:

1. The plant should be able to show actual production accurately for distinct machines during definite periods.

2. The product should be so standardized that large outputs may be obtained with all conditions identical except the amount of light used.

3. A fair proportion of the work must be done during hours of darkness or the factory must be so placed that the daylight is negligible.

These are the ideal conditions. In no case was it possible to realize them completely, but in four in-

stances data were secured which will interest all lighting men.

Test in Iron-Pulley-Finishing Shop.

The first test was conducted in a machine shop finishing iron pulleys, both large and small. The shop was some 40 by 80 ft. in extent, giving an area of 3200 sq. ft. As found, it was lighted largely by bare 60-watt lamps on drop cords, a few equipped with tin shades of some of the cheapest varieties. The consumption of electricity in this lighting amounted to 0.27 watt per sq. ft., and the resultant illumination averaged about 0.2 foot-candle. Of course, there were tremendous variations in the intensity; one operator had some 22 ft-cdl. directly under a lamp which was almost on the work, while others fumbled about under moonlight intensity of some 0.07 ft-cdl. The windows were so few and so dirty that the daylight effect was almost negligible except on one or two machines.

This typical lack of lighting equipment was remedied by installation of Reflecto-Cap 200-watt units mounted some 10 ft. above the floor. The electrical consumption was increased nearly 7 times, the average illumination nearly 25 times, with the result shown in Fig. 1. The Testing Department engineers prepared special forms for the use of the night foreman so that accurate record could be kept of every operation on every pulley machined while the production-record system of the factory gave similar data in a somewhat different form. From the two sets of records, the several operations were reduced to an actual basis of work done; from the size of the pulley surfaces, for example, the square feet of turning was computed. The work was done by Testing Department men from the viewpoint of the critical engineer looking for the fact, regardless of its implications, and their results may be taken as conservative. As shown in Table I,

Table I—Iron-Pulley-Finishing Shop.

40 by 80 ft.—13-ft. ceiling.

Old Equipment—	Drop cords, 60-watt lamps, bare or tin shades. 0.27 watt per sq. ft.; 0. ft-cdl.
New Equipment—	Reflecto-Cap 200-watt units, 10-ft. mounting. 1.9 watts per sq. ft.; 4.8 ft-cdl.

Results of Improved Lighting—

Character of work.	Office records.	Test records.
Square feet of turning	30% increase	35% increase
Square inches of boring	34% increase	16% increase
Set-screw holes		6% increase
Cubic inches of key seating	100% increase	
Balancing		22% increase

Average from test records = 20% increased production.
Average from all records = 35% increased production.
Cost—Maintenance (20 hr.), electricity, depreciation (15%), and interest (6%) = $105 per month = 5.5% of payroll ($1900 per month).

this increase in lighting gave increased production to the amount of 20%, if we take the testing engineer's records, or 35%, if we include the customer's own records in the total average.

In this particular instance, allowing 20 hours per month of 50-cent labor for cleaning the units, taking into account the increased consumption of electricity at the particular rate which this customer earns in Chicago, assigning at least a 7-year life to the units, and capitalizing the investment at 6%, the total cost will approximate $105 per month, which is some 5½% of the monthly payroll in this shop—from 20 to 35% increased production at a cost of 5½% of the payroll!

Test in Soft-Metal-Bearing Machine Shop.

The second test was also made in a machine shop, in this case manufacturing soft metal bearings, both steel casings and the Babbitt lining. Here a fourth requirement was necessary for the test. It was to so arrange the lighting system that there may be secured the intensity which has previously been considered good practice from the same units used to give daylight intensity, the only difference between the two being in the size of the lamps. In this shop 25 deep-bowl reflectors were equipped with 100-watt lamps to give 4.6 ft-cdl., just about what was obtained in the second part of the previous test. This required a consumption of 1 watt per sq. ft. The shop was run with this equipment for one month, the management's regular records proving quite sufficient to show output accurately. The 100-watt lamps were then replaced by 200-watt gas-filled lamps, thus bringing the consumption to 2 watts per sq. ft., and, because of the greater efficiency of the lamp, raising the illumination to nearly 13 ft-cdl. Fig. 2 shows the lighting effect

Table II—Soft-Metal-Bearing Machine Shop.

48 by 50 ft.

"Normal" Equipment—	25 100-watt vacuum Mazda lamps in deep-bowl reflectors. 1.0 watt per sq. ft.—4.6 ft-cdl.
"Productive" Equipment—	25 200-watt gas-filled Mazda lamps in deep-bowl reflectors. 2.0 watts per sq. ft.—12.7 ft-cdl.

Results of Productive Intensity—

Nature of operation.	
Flanging	20% increase
Hueing	24% increase
Rolling	9% increase
Setting	8% increase
Bundling	27% increase
Second bore	13% increase
Punching	10% increase
Perforate and blank	12% increase
Average from shop records	15% increase

obtained. It was the intention to repeat this cycle, returning to the lower intensity for the third month and finishing with the higher value during a fourth, but after the second month's experience using the daylight level, the management refused to return to normal, feeling that their production was of considerably more importance than the satisfaction of the testing engineers' desire to secure entirely unbiased data.

Comparing the two months, there is an increase of from 8 to 27% under the 12.7 ft-cdl. lighting—an average for eight different operations of 15% increase. If we keep in mind that the normal lighting in this case was of the value which showed at least 20% increase over typical industrial conditions in the first test, we might expect from 40 to 50% increase in a plant where the change was from the extremely low values, sometimes found, to the daylight level. We may think of possible increases, therefore, in two classes:

1. The advantage of even fair lighting over that now obtaining.

2. The further large improvement in going from fair to excellent lighting.

"In taking this last step," Mr. Durgin said, "we have increased production beyond anything before thought possible by merely increasing intensity, and we feel that we are justified, therefore, in speaking of the lighting level maintained as a true productive intensity."

Test in Machine Shop Handling Heavy Steel Parts.

In the third test, the machine-shop work was done upon heavy steel parts used in truck bodies. The shop was some 2400 sq. ft. in area, and this run also was made to compare a fair value with the productive daylight level. The same number of units, the same

reflectors and accessories were used for each system, the only change being between 100-watt gas-filled lamps requiring a consumption of 0.6 watt per sq. ft. and giving 3 ft-cdl. and 300-watt consuming 1.7 watt per sq. ft. and giving nearly 12 ft-cdl. Fig. 3 shows the shop lighted in this manner. Here the work was so varied and the workmen so variable that it was found necessary to change intensities at short intervals, the test engineer himself keeping the records. His results might be open to question on the score of prejudice if it were not that he shows a considerably lower increase than was obtained in the two preceding cases where the customers' records were used.

TABLE III—HEAVY-STEEL MACHINE SHOP.
40 by 58 ft.

"Normal" Equipment—13 100-watt gas-filled Mazda lamps in 23-in. eye-shield units. 0.6 watt per sq. ft.—3 ft-cdl.

"Productive" Equipment—13 300-watt gas-filled Mazda lamps in same units. 1.7 watts per sq. ft.—11.7 ft-cdl.

Results of Productive Intensity—
Nature of operation.

Drilling	11% increase
Milling	6% increase
Screw-machine work	14% increase
Average from test records	10% increase

Cost of Productive Intensity—
Additional electricity, additional cost of lamps, depreciation (15%) and interest (6%) on new units = $29 per month = 1.2% of payroll.

Quadrupling the intensity gave from 6 to 14% increase in three operations, averaging 10%. The cost of productive intensity for this shop figures 1.2% of the payroll.

TEST IN CARBURETOR-ASSEMBLING SHOP.

In the fourth test quite different conditions were met with. The work is assembling carburetors, the operators handling small parts and making rather delicate adjustments. The management of this shop is of the most efficient, aggressive type. They fully appreciated the need of plenty of light and had already installed equipment well above present average practice. The old equipment used 100 Mazda lamps, principally of the 40-watt size, consumed 1 watt per sq. ft. and gave an average illumination by actual test of a little over 2 ft.-cdl. For the productive intensity runs, the 100 units were replaced by 29, nearly doubling

Fig. 3.—View in Heavy-Steel Machine Shop As It Appeared With Productive Intensity Lighting.

the consumption per sq. ft., but increasing the intensity about six times. Fig. 4 shows this lighting.

Larger parts of both the preceding test and this one were run after the signing of the armistice. In both instances, the concerns were affected by the prevalent uncertainty through which we have been passing, but even under such conditions and notwithstanding the previous efforts of this management to

Fig. 4.—The Carburetor Assembling Shop After Illumination Was Raised to Productive Intensity.

TABLE IV—CARBURETOR ASSEMBLING SHOP.
50 by 80 ft.

Old Equipment—84 40-watt vacuum Mazda lamps in 4-light clusters; 2 100-watt bare gas-filled lamps; 14 drop cords with 40-watt lamps and tin shades. 1 watt per sq. ft.—2.1 ft-cdl.

"Productive" Equipment—19 300-watt gas-filled Mazda lamps in 23-in. eye-shield units; 10 200-watt gas-filled Mazda lamps in 16-in. eye-shield units. 1.9 watts per sq. ft.—12.5 ft-cdl.

Result of Productive Intensity—

Carburetor A	10.5% increase
Carburetor B	18.6% increase
Carburetor C	6.5% increase
Average from test records	12.0% increase

Cost—Maintenance (20 hr.), electricity, depreciation (15%) and interest (6%) = $57.90 per month = 0.9% of payroll ($6500).

speed carburetor assembling to its maximum, productive intensity showed an increase of 12% and, as the number of workmen was large and the average wage was high, this 12% increase was secured at a cost of 0.9% of the payroll.

With such facts before us, it seems certain that in productive intensities we have the greatest possibilities of service to industry, and wide adoption of such intensities is only a matter of getting the truth before the responsible executives.

DINNER TO COL. P. JUNKERSFELD BY ASSOCIATES IN WAR DEPARTMENT.

A farewell dinner was tendered to Col. P. Junkersfeld and Lieut.-Col. George B. Walbridge, of the Construction Division, United States Army, on the evening of March 3 at the Wardman Park Inn, Washington, D. C., by their associates in the very important work of building cantonments and other structures for the needs of the army. Over 180 of the officers engaged in this work for almost two years were present and there were many speeches and songs and the presentation of a beautiful silver cup to Colonel Junkersfeld, who on the following day left Washington to permanently resume his position as assistant to the vice-president of the Commonwealth Edison Co., Chicago.

Soon after we entered the war Colonel Junkersfeld entered the Construction Division of the Army with the rank of major, being subsequently promoted to lieutenant-colonel and later to colonel.

Some Possibilities of Steam Railroad Electrification

Reasons for Comparatively Slow Progress Are Given and Plea Made for Greater Co-operation Between Railroad and Electrical Interests

By CALVERT TOWNLEY

HERE is a frank statement on the railroad situation that should interest every man in the electrical industry. Mr. Townley contends that when the railroads are able to finance their required electrification it will test the capacity of the electrical manufacturers of the country to serve them.

Mr. Townley writes that electrification has been retarded because the problem has been largely considered one of replacing the steam locomotive by the electric locomotive, whereas in reality the problem is much broader and calls for the co-operation of both railroad interests and electrical engineers.

ELECTRICITY now performs every railroad service previously rendered exclusively by steam locomotives and in every case does it better than it was done before. But in order to use electricity a large investment in equipment and installation must be made and electrification has proceeded slowly because railroad executives were not convinced that the advantages to be gained are always worth the cost.

The progress of electrification has also been impeded, first, before the war by the difficulty in financing, due to conditions other than the merits of electrification, and second, since the war began, because every one has been too busy to consider any work that could be deferred and because the Government's taking over the railroads has created an unsettled situation not conducive to the investment of new capital for future returns. There seems to be ground for hoping that these bars to progress will be removed so that electrification can be again studied on its merits.

In reviewing the past 20 years' history of this question, I cannot escape the conclusion that we electrical men, and not our steam-road colleagues are responsible for the slow progress made. We have not known enough about either the science or the art of railroading. Our belief in, and our zeal for our own profession has lead us, albeit with entire honesty of purpose, to make more or less extravagent claims as to what we could do and to underestimate the cost of doing it. The inevitable reaction of mind which followed an accurate determination of facts of course disturbed confidence in our judgment. But if at times we have injured the cause of electrification by claiming too much, strange as it may sound, we have injured it a great deal more by not claiming enough. Electrical engineers not having always been railroad men, have been unable to study railroad problems as they should have been studied, that is to say with only real and not with any arbitrary limitations before them. It has been natural for the electrical man to ask the railroad man for a statement of the conditions he was expected to meet. It was equally natural for the railroad man to prescribe the conditions upon which his steam service was predicated. Under these circumstances the problem became largely one of replacing one sort of locomotive with another, and of balancing hoped-for economies in operation and maintenance on the one hand, against fixed charges for the additional investment required, on the other. Right there comes the mistake. A perfectly natural but yet a fundamental mistake, for which no individual or class should be censured but for which the unusual development of the art is responsible. We cannot blame railroad men for not being electrical engineers nor electrical engineers because they are not railroad men, but the progress of electrification has had to lag until both should be able to see, each with the eyes of both. It is only by combining the railroad's man knowledge of the fundamental requirements of his service with the electrical man's skill in applying electricity to perform that service that all the possibilities of any specific problem may be developed.

The electrification of a railroad is not simply the substitution of one kind of locomotive for another. It is far more than that. It is the adoption of a fundamentally different method of train propulsion. It is conservative to say that, within the bounds of ordinary practice, electricity can furnish every train with all the pulling power that can be used. The limitations of the steam locomotive in this respect disappear and ruling grades rule no longer. A strictly limited motive power is replaced by one that is practically unlimited.

There are a number of so-called "systems" of electric traction and heavy emphasis has been laid by the advocates of each upon its points of difference from every other. So much has been said about these differences and so little about the points of similarity as to create an entirely misleading impression. It is a fact that there are more kinds and types of steam locomotives in use many times over than there are electric systems. It is a fact that except for the storage-battery locomotive, which has but a limited field of application, all electric systems have many more common features than differences. It is a fact that they agree on fundamentals and differ in detail only. Their costs may not be the same, their efficiencies may vary but they all do their work and do it successfully and well. The possibility of unlimited electric power is a characteristic not of any one system but of all. It is due to basic differences between steam and electric equipment. A steam locomotive is a complete independent unit which not only generates but also

From a paper presented before the American Institute of Electrical Engineers at Foston, Mass., March 14.

utilizes its power. The electric locomotive generates no power at all. It is only a translating device receiving energy from an outside and a remote source. The electric power house always having much greater capacity than any one locomotive, can supply ample power for the heaviest train on the steepest grade. The steam locomotive which carries its own power house with it is limited to the capacity of its one boiler. By the multiple-unit principle, as many electric locomotives as may be needed can be coupled together and operated in synchronism by one crew from any cab. Any required tractive effort can thus be exerted without slipping the wheels, without imposing undue strains on the rails or bridges and without increasing the number of engine crews.

Advantages of Electric Freight and Passenger Haulage.

The business of a railroad is to transport freight and passengers. I put freight first because on the average it produces 73% of the revenue. Unlimited motive power permits longer trains and higher schedule speeds. On the Elkhorn grade of the Norfolk & Western the schedule speed was doubled. It cuts the operating cost by hauling more cars with the same or a smaller crew. The Norfolk & Western uses two electrics to do the work of three Mallets. These new opportunities at one fell swoop banish many of the railroad's time-honored traditions. The traffic possibilities must be studied from a new angle and advantage taken of every facility. It is a new thought to realize that train length is limited not by motive power but by the yard tracks and length of sidings, or that all the trailing tonnage that the draw bars will stand can be hauled. Nor are these new limits fundamental. Sidings can be extended, draw bars can be made stronger, if it pays to do it. In a word electrification opens up tremendous possibilities of increasing the freight capacity of a road and without it being necessary to build additional tracks.

While not as important as freight, passenger traffic likewise comes in for its share in the widened horizon and the vanishing tradition. Unlimited power of course is available but the absence of combustion is another basic advantage. Smoke and cinders disappear. Tunnel operation loses its terrors. Unobscured signals permit normal speeds with undiminished safety. Projects like the Pennsylvania terminal in New York depending entirely on submarine tunnel operation and previously impracticable, become immediately possible. Railroads owning valuable realty in cities can erect buildings thereon, where before smoky locomotives made any structure above the ground level impracticable. The aerial rights are now valuable. Multiple-unit operation has in fact made suburban traffic. The rapid acceleration made possible by electric traction has directed attention to the equal value of rapid retardation and has quickened the study of braking accordingly: also of modified coach design to bring about the more efficient loading and discharge of passengers. These combined possibilities secure increased schedule speeds and attract patronage. The people not only get over the line in a shorter time but as a corollary more people get over it in the same time. Again it is seen therefore that in passenger as in freight traffic the ability to do something that could not be done before, rather than to do the same thing at a lower cost is the most valuable attribute of electrification, and again we find a greatly augmented capacity without the need of additional tracks.

It is not my purpose to make an exhaustive comparison of the relative advantages of steam and electric operation. That has been done often and well by others. What I have said about the expanding opportunities for electrified service is by way of illustration to emphasize my plea that the question should always be viewed in its broader aspect and not hampered and restricted within any narrower limitations than properly belong to it.

I am going to assume, then, the broadest possible treatment and to suppose that every electrification project is to have its pros and cons most fully examined. The real and vital question then is, "How far will this lead us?" "To what extent may we expect complete electrification of all our roads?" Parts of a number of them have already been equipped. Many of these are numbered among our prominent roads, successful corporations which have had the advice of the most highly skilled executives and engineers, and which are progressive. The service performed on the electrified sections comprises practically every kind of railroad transportation. The Bluefield division of the Norfolk & Western R. R. in West Virginia is an example of an important coal road operating through the mountains. The Chicago, Milwaukee & St. Paul 440-mile main line, through Idaho and Montana, demonstrates what can be done by a transcontinental carrier on a large scale with through traffic, both freight and passenger. The New York, New Haven & Hartford 73-mile stretch between New York and New Haven shows how through freight and a heavy passenger traffic can be taken care of on the most congested four-track section of an important eastern carrier and what is possible for complicated freight-yard operation, while the New York Central and the Pennsylvania out of New York City are splendid examples of our greatest modern passenger terminal electrification. There are of course many other electrifications, but even if there were not, those named are of a character to command the respect and attention of the railroad world. Now, every one of these projects has been successful. Every one has justified itself. Nearly every one in its present scope represents an extension of the zone intially electrified, the most convincing evidence possible as to what views the operating companies hold regarding these several projects. Railroad officials are generally glad to give others the benefit of their experience so it is reasonably safe to say that operating statistics are available covering long enough periods so that the results to be expected from any proposed undertakings may be predicated on established facts and not upon theories. In the light of present day knowledge, therefore, what answer can we make to the question "Should all railroads be electrified?"

Taken together in 1910 there were in the United States 240,000 miles of railroad main line regardless of the number of tracks. Of this mileage approximately 1250 or one half of one per cent has been electrified or is today in process. The remaining 99½% comprises, of course, roads performing every variety of service. They range from the back country branch line built by some over-enthusiastic promoter ann now perhaps operated as part of a large system, only because operation cannot be avoided and regularly contributing its annual deficit, up to the most important through arteries of travel upon which the commerce and industry of the nation depend. Every sort of community is served; every kind of railroading has its place in this vast aggregation of effort and the variables in the problem are so multitudinous and their nature often so profound as to well

daunt the courage of one who seeks to formulate them for incorporation in a general statement. Fortunately or unfortunately, depending on the point of view, it has been my lot to have to deal with this electrification problem from both sides. At one period from the standpoint of an intimate affiliation with the development and manufacture of electrical apparatus and at another from that of one charged with official responsibility on the railroad's behalf. I am a thorough believer in the virtues of electrification and an enthusiast about the wonders which it can accomplish but I also have a keen appreciation of the almost infinite variations in the railroad problem and a very wholesome respect for the dollar. I do not believe that all railroads will ever be electrified. I am not sanguine even that all tracks of any one really big system will be so equipped in our time. It is a question of economics, and the results will not justify the expenditures even when considered with such broad vision as that which guided the Pennsylvania in spending millions to put its passenger terminal into New York City without the prospect of a direct return. Electrification will increase the track capacity. But there are thousands of miles of railroad that have sufficient capacity now, frequently several times over, and where the wildest stretch of imagination fails to picture a future need of this kind. Electrification works wonders in suburban and interurban passenger service. I have ridden for hours across the western prairies without seeing a single town, much less a city where these advantages would count. Electrification effects marked economies in fuel, in maintenance, in labor and otherwise through a long list; but electrification calls for a heavy investment and unless these economies bulk large enough, the interest on such investment will wipe them out and turn the enterprise into a losing venture. I do not believe the cause of electrification is helped by undue optimism on the part of its advocates. Rather should there be an enlightened partisanship, enthusiastic where enthusiasm is justified but tinged with the sober conservatism of the man who has to put his own dollars to work.

No Reason for Discouragement.

There need be no discouragement to the electrical engineer in the views just given, nor to the railroad man who has looked toward the new motive power for salvation. There are so many cases where electricity should be used, where its advantages are clear and conclusive, that once the railroads escape from the financial slough of despond in which they are now wallowing and are again able to get capital for their needs, there will not be enough engineers, there will not be enough electric factories in the country to serve them. Every big system has need of electricity somewhere. For some small roads it may mean the difference between solvency and bankruptcy. I electrified a short derelict line for the New Haven Road between Meriden and Middletown, long before given over into the one-train-a-day-annual-deficit class, and turned it into a good earner.

There can be no rule established. Generalities are sure to be misleading but electrification is now firmly intrenched and successful. It is recognized by the railroads generally as an effective agency with great possibilities and one which is particularly valuable for certain specific purposes. Time alone will tell how broad its application is to be but I am confident we can await developments with tranquility assured that the art is in a healthy condition and that progress will be along the right lines.

STORAGE-BATTERY TRACTORS AND LOCOMOTIVES FIND FAVOR IN NORTHWEST.

Following the heavy demand for storage-battery installations on launches and boats on Puget Sound and other waters of the Pacific Northwest, there has come an increasing number of sales of batteries for use on lumber tractors at sawmills and woodworking plants in Washington and Oregon. F. C. Gibson, Seattle sales agent for the Edison Storage Battery Co., of Orange, N. J., reports that between 25 and 30 lumber companies have equipped their yard tractors with the Edison type of alkaline batteries, which are of rugged construction that enables them to withstand severe usage.

Then, the large metal mines of the Coeur d'Alene and Butte districts have adopted, in many cases, the storage-battery locomotive for underground haulage, replacing the trolley line. This change not only contributes to greater safety, but to economy, when the cost and upkeep of the trolley lines are considered and compared with that of the storage batteries and charging stations. The storage-battery locomotive for underground ore haulage is equipped for a capacity of 4 to 8 tons, carrying 80 to 90 cells, and operating at about 100 volts.

In the Coeur d'Alene mining district, in northern Idaho, many such locomotives are in use. The Bunker Hill & Sullivan mines are said to use 8, divided between the General Electric, Westinghouse and Jeffery; the Hecla mines use six, and the Hercules three, all of which are Westinghouse make. All these locomotives are supplied with Edison storage batteries of 66 to 90 cells each.

Operations in those great mines are conducted on 12 to 15 different levels, 75 to 100 ft. apart vertically. This requires several charging stations for recharging the batteries, comprising a motor-generator set for each station to produce direct current, and distributing panels. The locomotives, not only on the charging-station level but those on the first level above and the first level below it, may be charged from the one station. It will be seen, then, that in the large mines having 10 to 15 working levels, several charging stations are required. The considerable number of storage-battery locomotives that have replaced the trolley-wire system of haulage at Butte are in the deep copper mines. In some instances batteries have been installed on former trolley locomotives, but in most cases new locomotives have been purchased which were built specially for storage-battery service.

The coal-mining law of Washington, which became effective on June 7, 1917, prohibits the operation of any underground trolley lines of a voltage higher than medium, which is defined as ranging between 300 and 600 volts; and in the installations of trolley lines made after above date the voltage shall not exceed 300, which for this purpose is designated as low voltage.

The same law specifies that storage-battery locomotives, when used in gaseous mines, are required to have cells and other electrical parts enclosed in flame-proof casings.

By reason of this law's provisions several coal mines recently opened in western Washington have been equipped with storage-battery locomotives. A case in point is that of the new mines of the Northwest Improvement Co., in Roslyn district, where four such locomotives were provided. It is probably a fact, also, that this decision was influenced by the greater economy of the installations adopted as well as by the requirements of the new law.

Largest A. E. F. Power Plant in France

Army Plant Supplies Immense Bakeries, Machine Shops, Etc. —Rapid Construction by Army Engineers and Quartermasters

By HENRY C. THIEL

First Lieutenant, Quartermaster Corps, United States Army.

THE power plant of the Mechanical Bakeries, of Is-sur-tille, Cote-d-or, France, is the largest U. S. Army power plant in France, having a total capacity of 2000 kw. It has been in continuous operation for the past 6 months.

The plans and specifications for this plant were drawn up by the Division of Construction and Forestry, A. E. F., at Tours. The site for the plant was chosen by the Chief Quartermaster, A. E. F., and in December of 1917 work was started on same. The power plant structure is of steel and reinforced concrete and is two stories in height and in addition to this structure it was also necessary to build a pump house on the banks of the river for our water supply. The plant includes the following equipment:

One General Electric steam turbine direct-connected to a 750-kw., 3-phase, 50-cycle alternator. Turbine is condensing.

One Westinghouse turbo-alternator of similar rating to above; and another of 500 kw.

Three Thompson Boiler Co. of England boilers of 15,000 lb. evaporation per hour each.

Three transformers of 200 kw. each, from 250 to 10,000 volts.

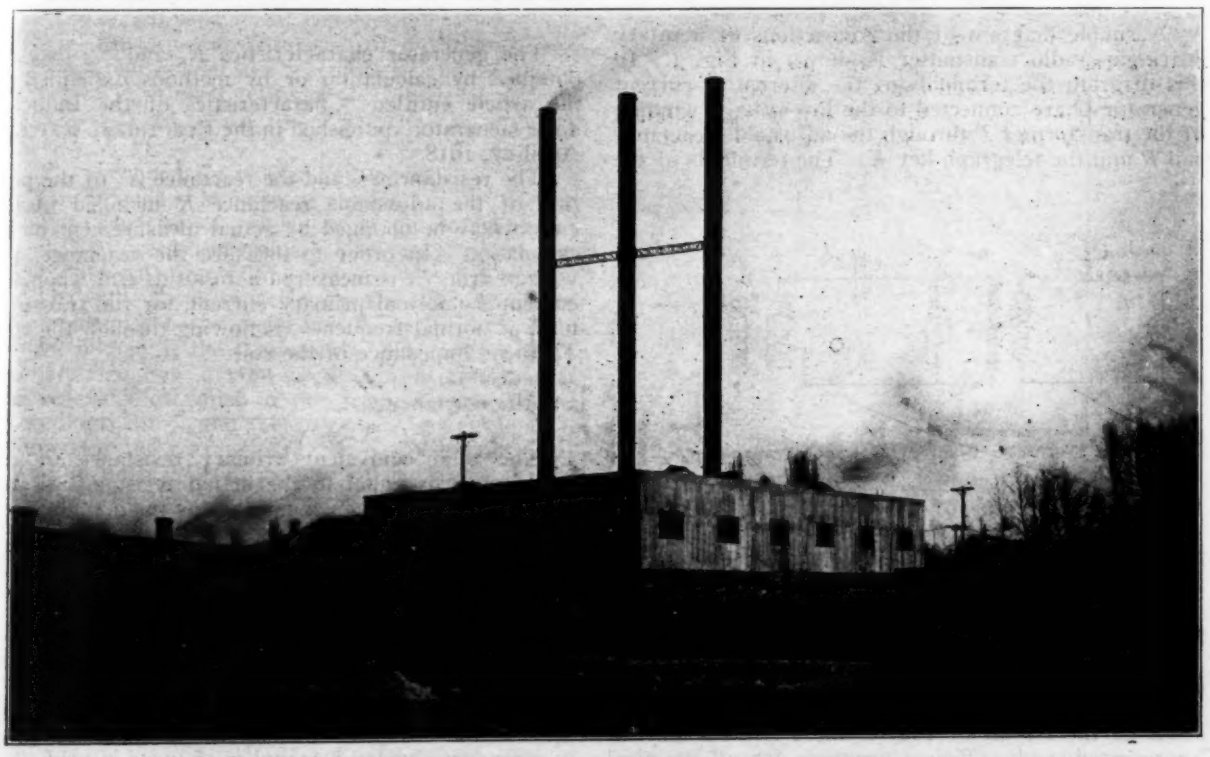
Two Worthington centrifugal pumps, each 75 hp.

Two boiler-feed pumps and two house or supply water pumps, steam driven.

Enlisted personnel from both the Engineer and Quartermaster Corps were engaged upon the construction and erection work. They worked 24 hours per day, laying tracks and building roads leading to the power-plant site, which is in what is now known as Camp Williams, the largest U. S. A. camp in France.

Our first delivery was a complete turbo unit from the shops of the General Electric Co. at Nancy and in a very short time the balance of our units followed. In the erection of this plant it was necessary to contend with many things that handicapped us that we would have avoided in times of peace. France had already given what she had and her supplies were entirely exhausted, making it necessary that we rely upon England for the majority of our equipment and supplies, and at this time it was not an easy matter to get material from England into France. We made our own patterns and in this way managed to overcome some of the delays, with the result that in August of 1918 we were sending current out over our transmission lines at 10,000 volts to several distribution centers, from where it was again stepped down to the proper voltage for the operation of the various machine shops and refrigerating plants and the largest mechanical bakery in the world with a daily output of over 700,000 loaves of bread per day.

This plant is run on an 8-hour shift by 14 soldiers from the Quartermaster Corps, who have all had similar experience in the States.



2000-kw. Power Station in France Built by Army Engineers.

Radio Transmitters of Synchronous Rotary Spark-Gap Type

First of Three Articles on Design of this Type of Radio Transmitter—Theory of the Simple Transmitter—Vector Diagram of Equivalent Circuit of Radio Transmitter

By MILLARD C. SPENCER

IN THE ELECTRICAL REVIEW of April 27, 1918, appeared an article by the writer on "Characteristics of the Inductor Type Generator," in which were described in some detail the principles of operation, method of testing, and predetermination of the characteristics of the inductor-type generator as used for radio work. This work is continued in the present series of articles to include all the rest of the low-frequency apparatus of the complete transmitter.

This series of articles on the design of radio transmitters of the synchronous, rotary spark-gap type will be divided into three parts as follows:

Part 1—Theory. In the first part, under the subject of theory, a simple graphical method of determining the current and voltage relations in the various parts of the transmitter circuit will be developed.

Part 2—Tests. In the second part the practical application of this graphical method in analyzing the results of tests made on radio transmitters will be taken up.

Part 3—Design. In the third part the application of this graphical method to the design of radio transmitters will be described in detail and illustrated by means of numerical examples.

PART 1—THEORY.

A simple diagram of the connections of a rotary spark-gap radio transmitter is shown in Fig. 1. In this diagram the terminals of the alternating-current generator G are connected to the low-voltage winding of the transformer T through the adjustable reactance coil R and the telegraph key K. The terminals of the

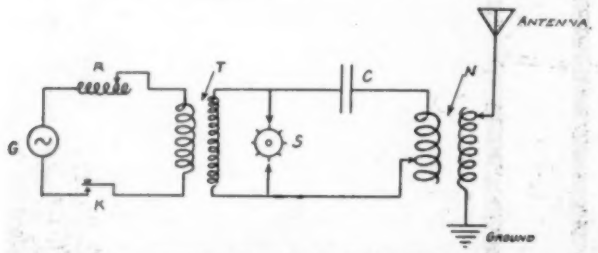


Fig. 1.—Circuit Diagram of Radio Transmitter.

high-voltage winding of the transformer T are connected to the stationary electrodes of the synchronous, rotary spark gap S. The high-voltage condenser C is shunted around the rotary gap through the primary winding of the oscillation transformer N. The secondary winding of this oscillation transformer is connected to the antenna and the ground as indicated.

For the purpose of studying the current and voltage relations of the low, or generator, frequency portions of the circuit of Fig. 1, these circuits may be represented, with sufficient accuracy for all practical purposes, by the equivalent circuit of Fig. 2. In this circuit of Fig. 2,

R_g = internal resistance of generator G;
X_g = internal effective reactance of the generator G (usually taken as equal to the synchronous impedance of the generator);
R_r = resistance of the adjustable reactance R included in the circuit;
X_r = reactance of the adjustable reactance R;
R_t = total equivalent resistance of the transformer expressed in terms of the primary;
X_t = total leakage reactance of the transformer expressed in terms of the primary;
R_l = equivalent load resistance;
X_c = effective condensive reactance of the condenser C reduced to primary terms.

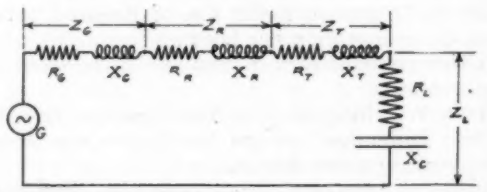


Fig. 2.—Equivalent Electric Circuit of a Radio Transmitter.

The generator characteristics R_g and X_g may be obtained by calculation or by methods explained in the article entitled "Characteristics of the Inductor Type Generator" published in the ELECTRICAL REVIEW, April 27, 1918.

The resistance R_r and the reactance X_r of the portion of the adjustable reactance R included in the circuit may be obtained by actual measurement or by calculation. In order to measure the reactance, the voltage drop E_r is measured across this coil when the current I (normal primary current for the transmitter), at normal frequency, is flowing through the coil. Then the impedance of the coil

$$Z_r = E_r/I$$

and the reactance

$$X_r = \sqrt{Z^2 - R_r^2}$$

The total equivalent primary resistance of the transformer is equal to the actual resistance of the primary (low-voltage) winding plus the actual ohmic resistance of the secondary (high-voltage) winding divided by the square of the ratio of transformation of the transformer; that is,

$$R_t = R_p + R_s/N^2$$

where

R_t = equivalent primary resistance,
R_p = resistance of primary winding,
R_s = resistance of secondary winding,
N = ratio of transformation = number of turns in secondary divided by number of turns in primary.

The total reactance of the transformer X_t may be determined as follows:

The secondary winding of the transformer is short-circuited and the primary winding is connected across the terminals of the generator. The voltage of the generator is then increased until normal current I, at normal frequency, flows through the primary winding of the transformer. The voltage E_t across the primary winding of the transformer is noted. The total impedance of the transformer is

$$Z_t = E_t/I$$

and the total leakage reactance of the transformer, expressed in primary terms,

$$X_t = \sqrt{Z_t^2 - R_t^2}$$

where

R_t = total equivalent primary resistance as determined above.

In case the primary and secondary leakage reactances are determined separately by calculation, or otherwise, then

$$X_t = X_p + X_s/N^2$$

where

X_t = equivalent primary leakage reactance (total),
X_p = actual leakage reactance of primary winding,
X_s = actual leakage reactance of secondary winding,
N = ratio of transformation of the transformer.

The equivalent load resistance

$$R_1 = W/I^2$$

where

W = output of transformer in watts,
I = corresponding primary current.

The capacity of the condenser C expressed in primary terms is equal to its actual capacity multiplied by the square of the ratio of transformation of the transformer; that is,

$$C_p = C_s \times N^2 \quad \ldots\ldots\ldots\ldots (1)$$

where

C_p = capacity of condenser expressed in primary terms,
C_s = actual capacity of condenser,
N = ratio of transformation of the transformer.

The apparent condensive reactance of this condenser, expressed in primary terms, is therefore

$$X_{cp} = 10^6/(2\pi \times f \times C_p) \quad \ldots\ldots\ldots (2)$$

where

X_{cp} = condensive reactance in ohms,
f = frequency in cycles per second,
C_p = capacity of condenser in microfarads, expressed in primary terms as obtained from equation (1).

The value X_{cp} is, however, not the effective condensive reactance to be used for X_c in Fig. 2. As is shown in Fig. 1, the condenser C (in series with the primary winding of the oscillation transformer N, the reactance of which at the generator frequency is exceedingly small and therefore can be neglected) is shunted by the rotary spark gap S. With the transmitter in normal operation the effect of this shunted spark gap on the condenser C seems to be to reduce its effective capacity. Therefore

$$X_c = k \times X_{cp} \quad \ldots\ldots\ldots\ldots (3)$$

where

X_c = effective condensive reactance,
k = a constant derived from tests as is to be explained in Part 2,
X_{cp} = apparent condensive reactance.

Having reduced the actual circuit of Fig. 1 to the equivalent circuit of Fig. 2, the current and voltage relations in the various parts of the circuit may be readily determined by means of the vector diagram of Fig. 3, which is constructed as follows:

The current vector OI (proportional to the current I at which it is desired to study the operation of the transmitter) is laid off in the horizontal direction from the point O and is taken as the reference line from which the rest of the diagram is constructed. Starting from the point O and proceeding around the circuit the various voltage drops are laid off in their proper magnitude and phase relation. First OA, equal to $I \times R_g$ the voltage drop caused by the current I flowing through the internal resistance R_g of the generator, is laid off, in phase opposition to the current vector OI, to some convenient scale. Then AB, proportional to the reactance drop $I \times X_g$ caused by the current I flowing through the internal reactance X_g of the generator, is drawn in, to the same scale, from the point A perpendicular to the current vector OI — the reactance voltage being 90° out of phase with the current. By completing the triangle OAB the total voltage $E_g = OB$, required to overcome the internal impedance of the generator, is obtained. Proceeding in like manner the triangles BCD and DEF are drawn in with the vectors representing the resistance drops, in the regulating reactance coil and the transformer, in phase opposition to the current OI and the vectors representing the reactance drops 90° out of phase with the current OI. In this way both the magnitude and phase relation of the voltage $E_r = BD$ required to force the current I through the reactance coil, and the voltage $E_t = DF$ required to overcome the impedance of the transformer, are obtained.

From the point F the vector $FG = I \times R_1$, the voltage drop caused by the current I flowing through the equivalent load resistance R_1, is drawn in parallel to OI. From G the vector $GH = I \times X_c$, the voltage drop across the condensive reactance X_c, is drawn in the opposite direction to the inductive reactance drops IX_r, IX_g and IX_t. It is at once seen that the current I *leads* the resultant voltage $E_1 = FH$ required across the load by the angle HFG. Experimental proof will be given in Part 2 showing that such is actually the case.

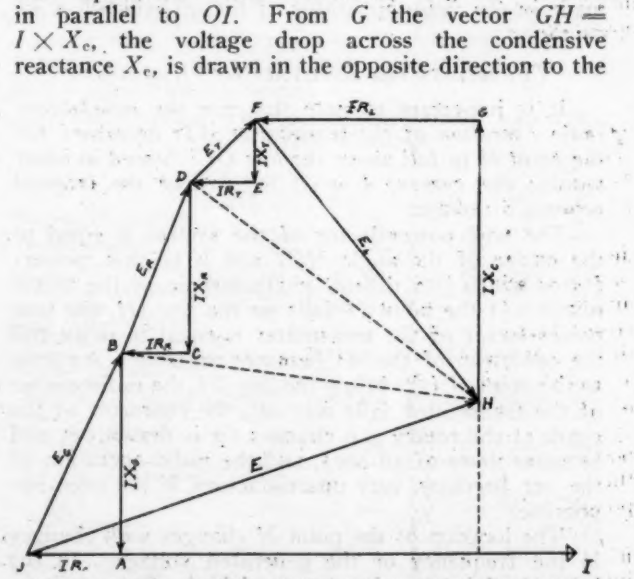


Fig. 3.—Vector Diagram of Equivalent Circuit for Radio Transmitter.

Having constructed the diagram of Fig. 3, it is possible to at once determine the current and voltage relations for any part of the circuit. For instance, the vector DH represents, in both magnitude and

phase relation, the voltage across the primary winding of the transformer *T*. If a voltmeter, ammeter and wattmeter were connected directly to the terminals of the transformer *T* the voltage indicated by the voltmeter would be equal to *DH* and the power-factor as calculated from the readings of these three instruments would be equal to the cosine of the angle *DHE*. The vector *BH* represents in both magnitude and phase relation the voltage at the terminals of the generator. The power-factor as determined by a voltmeter, ammeter and wattmeter placed across the terminals of the generator would be very nearly equal to unity, being equal to the cosine of the very small angle *HBC*.

The vector diagram of Fig. 3 shows very clearly that the power-factor of a radio circuit as determined by a voltmeter, ammeter and wattmeter has little meaning, depending as it does on the particular point in the circuit at which it is measured.

By connecting the points *O* and *H* of the vector diagram, the vector *E* is obtained which is equal to the internal voltage which must be generated in the generator *G* in order to force the current *I* through the primary circuit of the transformer and therefore deliver a power of *W* watts at the secondary terminals of the transformer *T*. This, of course, is one of the principal objects in constructing the vector diagram as it enables the voltage to be determined for which a generator must be designed in order to operate a given radio set at a certain power output. Conversely, knowing the characteristics of a particular generator it is possible, by assuming different current values, to determine the maximum amount of power which can be obtained from the generator with a given radio transmitter. Furthermore, with the aid of this diagram it is possible to determine how any changes made in the radio apparatus of the set will affect its operation.

Conditions for Satisfactory Operation.

It is important to note that *for the satisfactory radio operation of the transmitter it is necessary for the point H to fall above the line OI*. Stated in other words; *the current I must lag behind the internal generated voltage*.

The true power-factor of the system is equal to the cosine of the angle *HOI* and it is this power-factor which is a definite characteristic of the transmitter. If the point *H* falls on the line *OI*, the true power-factor of the transmitter is equal to unity and the operation of the set becomes unstable. As soon as the point *H* falls below the line *OI*, the radio output of the transmitter falls way off, the character of the spark at the rotary gap changes (it is drawn out and becomes more of an arc), and the radio operation of the set becomes very unsatisfactory, if not even impossible.

The location of the point *H* changes with changes in the frequency or the generated voltage. In the interest of increased output and high efficiency it is, however, desirable that the transmitter be operated with the point *H* as close to the line *OI* as possible without danger of the point *H* actually reaching the line *OI* due to the unavoidable frequency and voltage changes of the generator and thus causing the operation of the transmitter to become unstable. The nearer the point *H* approaches the line *OI* the greater will be the output which can be obtained from a given generator with a particular transmitter and, in general, the higher will be the efficiency.

(To be continued.)

SOLVING TRADE PROBLEMS BY INTERNATIONAL BUSINESS CONFERENCES.

New British Import Restrictions Amicably Discussed by British and American Commercial Interests.

Direct international conferences between the business men actually concerned are being held by the American Chamber of Commerce in London in order to solve the deadlock in Anglo-American trade produced by the new British restrictions.

This method of reaching agreements has the full support of the American Chamber in London on the ground that it exactly agrees with the experience of the Americans who have been responsible for the sale in Great Britain of hundreds of millions of dollars worth of goods in the past years. "When selected representatives of the British and the American sections of any trade meet around a table to discuss the problems of their Anglo-American trade," the Chamber reports, "good is bound to result."

"They become aware that they are all business men together, working for the sound development of their own business and the best interests of labor and commerce. They find that half the dangers of which they were so afraid are purely imaginary and that the other half can be solved by carefully prepared plans. We believe most strongly in the power of these direct conferences to prepare international plans better than either government can offer, and to bring about a true and lasting friendship."

Numerous conferences have already been held under the direction of the Chamber, between committees representing importers of the American goods on the one hand and the makers of competing British goods on the other.

The essential points in holding these conferences, the chamber reports, are: carefully prepared facts and proposals from each side, a clear statement of the principles of international business co-operation and a competent chairman. Conferences will be held in all trades affected by the restrictions.

CIVIL SERVICE EXAMINATIONS FOR JUNIOR INSPECTORS.

Inspectors of Radio Apparatus, Telephone Equipment, Telegraph Equipment and Field Glasses in the Signal Service of War Department.

The United States Civil Service Commission will hold examinations for four classes of positions as junior inspectors in the Signal Service at Large of the War Department. These positions are as follows: Junior inspector of radio apparatus, salary $1200 to $1500 a year; junior inspector of field glasses, $1200 a year; junior inspector of telephone equipment, $1200 to $1500 a year; junior inspector of telegraph equipment, $1200 to $1500 a year. Applicants must have attained at least the equivalent of a four years' high school course, and have at least six months' experience in the particular line of work designated. They must be under 55 years old. Applicants will not be assembled for examination and the examinations are not set for any particular date. The rating will be based on the following relating weighting: Physical ability, 10; education, training, experience and fitness, 90. Sworn statements and corroborative evidence will be necessary to bring out the facts regarding education, training, experience, etc. Applicants should secure Form 1312 from the Civil Service Commission, Washington, D. C., or its local offices in the principal cities.

CENSUS BUREAU GIVES OUT ADDITIONAL CENTRAL-STATION STATISTICS.

Washington, Iowa, North and South Carolina, Kansas, Illinois, Georgia, Maine and Louisiana Gain.

The central-station statistics for nine more states which have been given out by Director Sam L. Rogers of the Census Bureau show substantial increases in every instance. Other reports from 27 states and the District of Columbia have already been published in previous issues of the ELECTRICAL REVIEW. They relate to the years ending Dec. 31, 1907, 1912 and 1917 and cover both commercial and municipal plants, but not those operated by factories, hotels, etc., or those operated by the Federal Government and state institutions or those idle or in the course of construction.

Considerable increases are shown by the Washington central stations for the five-year period 1912-1917, but their significance is diminished by reason of the fact that certain establishments which did both light and power and railway business were reported as in the electric-railway industry in 1912 but have been treated as belonging to the light and power industry in 1917.

CENTRAL-STATION STATISTICS FOR WASHINGTON.

	1917.	1912.[1]	1907.	Per cent of increase.[2] 1907 to 1917.	1912 to 1917.
Number of establishments	88	70	71	.....	.....
Commercial	74	60	65	.....	.....
Municipal	14	10	6	.....	.....
Income[3]	$4,295,845	$3,087,721	$3,410,542	26.0	39.1
Electric service	$4,201,216	$2,976,297	$3,219,814	30.5	41.2
All other	$94,629	$111,424	$190,728	—50.4	—15.1
Total expenses, including salaries and wages	$3,433,747	$2,270,132	$2,388,628	43.8	51.3
Number of persons employed	1,112	1,078	885	25.6	3.2
Salaries and wages	$1,093,365	$880,309	$800,441	36.6	24.2
Total hp.	151,038	95,884	67,224	124.7	57.5
Steam engines:					
Number	46	55	64	.....	.....
Hp.	36,270	18,128	11,016	229.2	100.1
Internal-combustion engines:					
Number	16	3	2	.....	.....
Hp.	600	165	90	.....	263.6
Water wheels:					
Number	70	64	48	.....	.....
Hp.	114,168	77,591	56,118	103.4	47.1
Kw. capacity of dynamos	99,875	57,283	66,308	50.6	74.4
Output of stations, kw-hr.	242,370,956	71,414,473	257,785,236	—6.0	239.4
Stationary motors served:					
Number	5,678	2,279	1,933	193.7	149.1
Hp.	64,694	28,148	29,686	117.9	129.8
Number of street lamps:					
Arc	1,047	2,661	[4]	.....	—60.7
Incandescent, etc.	26,594	20,223	[4]	.....	31.5

[1]Many of the companies operate both light and power stations and electric railways, and their systems of bookkeeping will not always permit the preparation of separate reports. For this reason, a number of establishments reported as in the light-and-power-station industry in 1907 were treated as belonging to the electric-railway industry in 1912; but some of these establishments were restored to the light and power industry for 1917. In every case the establishment was assigned to that industry to which the greater part of its operations pertained. [2]A minus sign (—) denotes decrease. Percentages are omitted where the base is less than 100. [3]Exclusive of $5,556,757 in 1917 and $4,422,080 in 1912, reported by street and electric railway companies as income from the sale of electric current. [4]Not available.

In 1917 water supplied the greater part of the primary power in Iowa, 62.9%; but in 1912 and 1907 steam was the principal source of power, contributing 87.4% and 90.6½, respectively, of the totals for those years. This change was due to the completion of the immense plant on the Mississippi River with power house at Keokuk, Iowa. The total dynamo capacity, 184,506 kw., shows an increase of 246.6% as compared with 1912, the rate of increase during the preceding five-year period being 66.1%. The output of current generated, 614,808,584 kw-hr., represented an increase of 815.3% over 1912, as against 78% for the period 1907-12. This great increase in current generated was also due to the starting up of the plant at Keokuk, which distributes current not only in Iowa, but in several adjoining states.

CENTRAL-STATION STATISTICS FOR IOWA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	325	223	192	69.3	45.7
Commercial	181	159	141	28.4	13.8
Municipal	144	64	51	.....	.....
Income[2]	$10,240,235	$4,405,365	$2,479,969	312.9	132.4
Electric service	$ 9,785,509	$4,078,167	$2,317,880	322.2	139.9
All other	$ 454,726	$ 327,198	$ 162,089	180.5	39.0
Total expenses, including salaries and wages	$ 8,669,600	$3,328,740	$1,983,613	337.1	160.4
Number of persons employed	2,083	1,329	855	143.6	56.7
Salaries and wages	$ 1,679,790	$ 921,096	$ 547,177	207.0	82.4
Total hp.	263,804	77,131	46,739	464.4	242.0
Steam engines:					
Number	265	308	284	—6.7	—14.0
Hp.	90,675	67,444	42,342	114.1	34.4
Internal-combustion engines:					
Number	158	52	11	.....	.....
Hp.	7,251	2,658	564	1185.6	172.8
Water wheels:					
Number	92	58	44	.....	.....
Hp.	165,878	7,029	3,833	4227.6	2259.9
Kilowatt capacity of dynamos	184,506	53,237	32,056	475.6	246.6
Output of stations, kw-hr.	614,808,584	67,166,647	37,729,072	1529.5	815.3
Stationary motors served:					
Number	13,039	8,773	2,643	393.3	48.6
Hp.	89,902	43,820	14,547	518.0	105.2
Number of street lamps:					
Arc	2,479	3,637	[3]	.....	—31.8
Incandescent, etc.	49,652	27,479	[3]	.....	80.7

[1]A minus sign (—) denotes decrease; percentages omitted where base is less than 100. [2]Exclusive of $2,487,981 in 1917 and $1,144,220 in 1912, reported by street and electric railway companies as income from electric current. [3]Not available.

The number of establishments in North Carolina and South Carolina increased from 155 in 1912 to 241 in 1917. The actual number of new stations added since 1912, however, was 110, of which 65 were commercial and 45 municipal; but, as the result of a number of combinations in the commercial systems and various other changes, a net increase of only 86 establishments, of which 51 are municipal and 35 commercial, is shown by the figures.

CENTRAL-STATION STATISTICS FOR NORTH CAROLINA AND SOUTH CAROLINA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	241	155	111	117.1	55.5
Commercial	120	85	58	.....	.....
Municipal	121	70	53	.....	.....
Income[2]	$9,911,925	$5,958,586	$1,444,859	586.0	66.3
Electric service	$9,482,231	$5,670,150	$1,393,380	580.5	67.2
All other	$ 429,694	$ 288,436	$ 51,479	734.7	49.0
Total expenses, including salaries and wages	$7,626,168	$3,896,878	$1,071,590	611.7	95.7
Number of persons employed	1,640	1,136	509	222.2	44.4
Salaries and wages	$1,165,775	$ 713,534	$ 276,370	321.8	63.4
Total hp.	495,023	283,479	104,798	372.4	74.6
Steam engines:					
Number	191	157	132	44.7	21.7
Hp.	95,274	54,438	19,256	394.8	75.0
Internal-combustion engines:					
Number	30	6	1	.....	.....
Hp.	993	535	150	562.0	85.6
Water wheels:					
Number	165	140	84	.....	17.9
Hp.	398,756	228,506	85,392	367.0	74.5
Kilowatt capacity of dynamos	311,915	175,507	65,182	378.5	77.7
Output of stations, kw-hr.	872,142,636	427,324,494	81,868,105	965.3	104.1
Stationary motors served:					
Number	6,082	7,328	1,218	399.3	—17.0
Hp.	97,013	188,215	41,733	132.5	—48.5
Number of street lamps:					
Arc	2,893	4,083	[3]	.....	—29.1
Incandescent, etc.	21,441	8,407	[3]	.....	155.0

[1]A minus sign (—) denotes decrease; percentages are omitted where base is less than 100. [2]Exclusive of $2,500,345 in 1917 and $1,206,248 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

Large increases are shown for substantially all items in the report of the Kansas central stations, the

growth in the industry from 1912 to 1917 being greater in absolute amounts than during the preceding five years, although some of the percentages of increase are less for the later period than for the earlier. The number of stations increased from 111 in 1907 to 176 in 1912 and to 302 in 1917. The actual number of new establishments added since 1912 was 138, of which 51 were commercial and 87 municipal

CENTRAL-STATION STATISTICS FOR KANSAS.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	302	176	111	172.1	71.6
Commercial	116	94	79	.....	.....
Municipal	186	82	32	.....	.....
Income[2]	$6,954,518	$3,020,154	$1,514,867	359.1	130.3
Electric service	$6,733,688	$2,909,012	$1,419,091	374.5	131.5
All other	$ 220,830	$ 111,142	$ 95,776	130.6	98.7
Total expenses, including salaries and wages	$6,014,633	$2,626,270	$1,201,101	400.8	129.0
Number of persons employed	1,775	1,109	567	213.1	60.1
Salaries and wages	$1,409,778	$ 787,189	$ 374,496	276.4	79.1
Total hp.	207,854	98,328	48,374	329.7	111.4
Steam engines:					
Number	209	192	167	25.1	8.9
Hp.	167,885	82,372	38,035	341.4	103.8
Internal-combustion engines:					
Number	275	103	19	.....	167.0
Hp.	21,965	7,136	1,678	1209.0	207.8
Water wheels:					
Number	34	26	36	.....	.....
Hp.	18,004	8,820	8,661	1007.9	104.1
Kilowatt capacity of dynamos	143,274	69,205	30,307	372.7	107.0
Output of stations, kw-hr.	269,983,648	133,252,988	59,740,179	351.9	102.6
Stationary motors served:					
Number	7,252	5,021	1,425	409.0	44.4
Hp.	121,259	33,277	12,033	907.7	264.4
Number of street lamps:					
Arc	2,666	3,933	[3].....	.....	—32.2
Incandescent, etc.	35,170	14,573	[3].....	.....	141.3

[1]A minus sign (—) denotes decrease; per cent not computed where base is less than 100. [2]Exclusive of $518,326 in 1917 and $283,522 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

The actual number of new establishments added in Illinois since 1912 was 117, of which 82 were commercial and 35 municipal; but, as the result of a number of combinations in the commercial systems and various other changes, a net increase of only 34 establishments, 12 of which were commercial and 22 municipal, is shown by the figures.

CENTRAL-STATION STATISTICS FOR ILLINOIS.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	303	269	383	—20.9	12.6
Commercial	182	170	271	—32.8	7.0
Municipal	121	99	112	8.0	22.2
Income	$46,245,976	$30,045,297	$15,465,993	199.0	53.9
Electric service	$45,402,293	$27,376,119	$14,566,772	211.7	65.8
All other	$ 843,683	$ 2,669,178	$ 899,221	—6.2	—68.4
Total expenses, including salaries and wages	$37,921,833	$23,557,887	$10,055,463	277.1	61.0
Number of persons employed	9,294	8,036	3,902	138.2	15.7
Salaries and wages	$ 8,636,523	$ 6,223,882	$ 3,032,721	184.8	38.8
Total hp.	1,046,386	645,631	299,246	249.7	62.1
Steam engines:					
Number	503	576	733	—31.4	—12.7
Hp	982,740	605,227	287,898	241.4	62.4
Internal-combustion engines:					
Number	119	35	19	.....	.....
Hp.	4,661	3,042	870	435.7	53.2
Water wheels:					
Number	90	92	80	.....	.....
Hp.	58,985	37,362	10,478	462.9	57.9
Kilowatt capacity of dynamos	737,621	477,917	209,226	252.5	54.3
Output of stations, kw-hr.	2,210,372,750	1,150,900,306	467,657,328	372.6	92.1
Stationary motors served:					
Number	20,559	46,278	21,675	—5.2	—55.6
Hp.	1,079,652	315,659	137,661	684.3	242.0
Number of street lamps:					
Arc	15,002	35,399	[2].....	.....	—57.6
Incandescent, etc.	132,380	41,065	[2].....	.....	222.4

[1]A minus sign (—) denotes decrease. Percentages are omitted where base is less than 100. [2]Not available.

The actual number of new establishments added in Georgia since 1912 was 60, of which 20 were commercial and 40 municipal, but, as the result of a number of combinations in the commercial systems and various other changes, a net increase of only 50 establishments, 44 of which were municipal, is shown by the figures. The greater part of the power at each of the three censuses for which figures are given was derived from water, which supplied 59.8% of the total horsepower in 1917 and 59.1% in 1912.

CENTRAL-STATION STATISTICS FOR GEORGIA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	176	126	93	.....	.....
Commercial	48	42	34	.....	.....
Municipal	128	84	59	.....	.....
Income[2]	$3,447,235	$1,968,599	$1,110,510	210.4	75.1
Electric service	3,375,221	1,881,985	1,086,601	210.6	79.3
All other	72,014	86,614	23,909	201.2	—16.9
Total expenses, including salaries and wages	2,698,730	1,655,420	844,557	219.5	63.0
Number of persons employed	915	697	384	138.3	31.3
Salaries and wages	583,891	417,959	232,711	150.9	39.7
Total hp.	125,574	87,951	54,704	129.7	42.9
Steam engines:					
Number	174	156	104	67.3	11.5
Hp.	50,055	35,274	18,229	174.6	41.9
Internal-combustion engines:					
Number	17	4	1	.....	.....
Hp.	518	720	140	270.0	—28.1
Water wheels:					
Number	58	45	37	.....	.....
Hp.	75,101	51,957	36,335	106.7	44.5
Kilowatt capacity of dynamos	84,330	56,232	35,446	137.9	50.0
Output of stations, kw-hr.	184,136,059	87,571,815	59,311,202	210.4	110.3
Stationary motors served:					
Number	4,238	1,964	410	933.6	115.8
Hp.	81,517	50,633	11,078	635.8	61.0
Number of street lamps:					
Arc	480	2,370	[3].....	.....	—79.7
Incandescent, etc.	14,590	7,283	[3].....	.....	100.3

[1]A minus sign (—) denotes decrease; percentages are omitted where base is less than 100. [2]Exclusive of $4,880,551 in 1917 and $2,305,083 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

The actual number of new stations added in Maine since 1912, however, was 27, all of which were commercial; but, as the result of a number of combinations in the commercial systems, and other changes, an increase of only 14 establishments is shown.

CENTRAL-STATION STATISTICS FOR MAINE.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	93	79	81	.....	.....
Commercial	87	75	77	.....	.....
Municipal	6	4	4	.....	.....
Income[2]	$3,169,388	$2,118,508	$1,453,016	118.1	49.6
Electric service	$2,910,645	$1,815,086	$1,324,648	119.7	60.4
All other	$258,743	$303,422	$128,368	101.6	—14.7
Total expenses, including salaries and wages	$2,404,786	$1,577,938	$1,181,255	103.6	52.4
Number of persons employed	772	629	502	53.8	22.7
Salaries and wages	$619,739	$402,394	$308,006	101.2	54.0
Total hp.	98,248	89,683	57,880	69.7	9.5
Steam engines:					
Number	52	58	83	.....	.....
Hp.	22,478	19,610	18,114	24.1	14.6
Internal-combustion engines:					
Number	7	3	.....	.....	.....
Hp.	180	135	.....	.....	33.3
Water wheels:					
Number	192	175	132	45.4	9.7
Hp.	75,590	69,938	39,766	90.1	8.1
Kw. capacity of dynamos	63,242	58,757	39,290	61.0	7.6
Output of stations, kw-hr.	165,504,379	117,092,565	66,136,651	150.2	41.3
Stationary motors served:					
Number	3,890	2,258	1,304	198.3	72.3
Hp.	56,985	32,535	19,372	194.2	75.1
Number of street lamps:					
Arc	322	1,411	.....	.....	—77.2
Incandescent, etc.	17,918	9,839	.....	.....	82.1

[1]A minus sign (—) denotes decrease; percentages omitted where base is less than 100. [2]Exclusive of $1,068,302 in 1917 and $789,166 in 1912, reported by street and electric companies as income from sale of electric current.

The report of the central stations of Louisiana show considerable increases in substantially all items for both five-year periods covered by the table, but the increases from 1912 to 1917 are in most cases much greater than those for the preceding five years. Although steam supplied the greater part of the horsepower at each of the three censuses for which figures are given, no water power being reported, there was a rapid increase in the amount of power derived from internal-combustion engines—from 420 horsepower in 1907 to 990 in 1912 and to 6757 in 1917. The decrease from 1907 to 1912 was due to the fact that one of the largest electric companies in the state, which in 1907 generated its current, in 1912 purchased current from an electric railway company. Similar conditions also prevailed, but to a lesser extent, in 1917 as compared with 1912. The number of arc lamps used for street lighting decreased from 4474 in 1912 to 4295 in 1917, while the number of incandescents increased from 4451 to 7266.

CENTRAL-STATION STATISTICS FOR LOUISIANA.

	1917.	1912.	1907.	Per cent of increase,[1] 1907 to 1917.	Per cent of increase,[1] 1912 to 1917.
Number of establishments	85	50	42	.....	.....
Commercial	49	27	21	.....	.....
Municipal	36	23	21	.....	.....
Income[2]	$3,244,789	$2,278,754	$1,852,383	75.2	42.4
Electric service	$3,220,314	$2,251,102	$1,829,128	76.1	43.1
All other	$24,475	$27,652	$23,255	5.2	—11.5
Total expenses, including salaries and wages	$2,459,868	$1,604,019	$1,291,908	90.4	53.4
Number of persons employed	669	489	541	23.7	36.8
Salaries and wages	$530,515	$371,034	$382,982	38.5	43.0
Total hp.	36,005	27,165	23,292	54.6	32.5
Steam engines:					
Number	81	86	86	.....	.....
Hp.	29,248	26,175	22,872	27.9	11.7
Internal-combustion engines:					
Number	72	9	3	.....	.....
Hp.	6,757	990	420	1508.8	582.5
Water wheels:					
Number	.....	.....	.....	.....	.....
Hp	.....	.....	.....	.....	.....
Kw. capacity of dynamos	25,762	19,169	15,175	69.8	34.4
Output of stations, kw-hr.	26,009,144	18,328,080	26,421,316	—1.6	41.9
Stationary motors served:					
Number	2,863	2,428	1,713	67.1	17.9
Hp	37,189	24,557	16,110	130.8	51.4
Number of street lamps:					
Arc	4,295	4,474	[3]	.....	—4.0
Incandescent, etc.	7,266	4,451	[3]	.....	63.2

[1] A minus sign (—) denotes decrease; percentages are omitted where base is less than 100. [2] Exclusive of $691,798 in 1917 and $549,047 in 1912, reported by street and electric railway companies as income from sale of electric current. [3] Not available.

PRELIMINARY FIGURES ON ELECTRIC RAILWAYS GIVEN OUT.

Quinquennial Report of Census Bureau Includes Figures for 33 States.

Preliminary figures of the forthcoming quinquennial report on electric railway systems of a number of states have been given out by Director Sam. L. Rogers, of the Bureau of Census, Department of Commerce. These statistics relate to the years ending Dec. 31, 1917, 1912 and 1907 and the totals include electric light and power plants operated in connection with electric railways and not separable therefrom, but do not include mixed steam and electric railroads nor railways under construction. To date, 30 reports have been given out which include the figures for 33 states. They were prepared under the supervision of Eugene F. Hartley, chief statistician for manufacturers.

These reports, the principal items from which are reproduced herewith, show very plainly the effects of increased operating costs, taxes, wages, etc., on the railways of many states. While the greater portion of the states report gains during the last five-year period, these increases were not as great as during the previous period, 1907 to 1912, and were offset by the larger increase in expenses. In several instances there were marked losses in nearly all items during the latter period.

In several states the substantial increases made in the light and power business, which the railways carried on in conjunction with their traffic business, enabled the railways to make a much better showing than they otherwise would. In other states, however, the reports show that the railroads purchased all power used during the latter period and in others the greater portion of the additional power used was purchased, showing a tendency in this direction.

The figures are shown in the accompanying table at the bottom of this page.

CENSUS BUREAU STATISTICS ON ELECTRIC RAILWAYS.

State.	Number of Companies. 1917	1912	Miles of Line. 1917	1912	Cars. 1917	1912	Persons Employed. 1917	1912	Output of Electric Stations. Kw-hr. 1917	1912	Current Purchased. Kw-hr. 1917	1912	Passengers Carried. 1917	1912	Net Income. 1917	1912
Alabama	14	12	273.21	225.62	639	596	2,129	1,973	21,503,940	82,955,108	94,718,843	4,795,740	84,962,155	74,889,350	661,850	747,836
Ariz. & N. M.	6	6	57.49	54.19	66	52	224	162	1,526,960	685,400	4,010,388	2,749,807	9,488,467	5,802,885	$ 32,844	*27,250
Arkansas	10	10	94.81	95.15	262	287	645	755	33,080,677	24,838,981	4,360,889	2,524,889	30,525,360	28,168,102	261,318	415,969
California	38	42	1,885.12	1,765.83	5,542	4,652	15,977	16,749	12,248,329	11,274,069	500,094,869	481,625,400	638,632,142	683,326,934	*3,823,179	2,464,490
Colorado	15	17	337.15	348.43	817	785	2,402	2,498	98,227,472	97,915,436	13,281,070	8,458,015	102,882,744	107,502,972	210,336	1,258,760
Conn. & R. I.	17	20	1,141,39	1,087.73	3,434	3,412	8,453	8,179	191,131,590	157,634,664	33,916,210	27,336,932	377,673,712	316,749,300	*91,070	1,926,330
Florida	8	8	151.73	140.61	333	269	1,029	975	31,101,546	25,026,633	971,610	502,580	38,625,356	34,041,372	540,851	389,507
Georgia	14	15	339.73	340.51	777	730	3,009	2,852	319,184,303	54,510,462	45,506,100	71,309,669	114,021,766	103,592,240	1,044,180	1,263,643
Ida. & Wyo.	6	6	120.01	108.62	88	64	204	224	.....	.....	6,587,229	6,144,296	5,036,166	6,013,434	15,538	*3,846
Kentucky	11	10	355.64	356.74	1,059	1,010	2,857	3,591	71,257,192	73,815,374	30,516,586	15,059,597	109,105,583	103,512,260	751,157	1,282,959
Louisiana	11	15	229.99	198.67	831	747	3,169	3,236	132,426,292	86,263,736	5,314,781	23,086,310	134,017,669	117,037,478	612,459	1,470,596
Massachusetts	58	60	2,424.00	2,328.30	9,515	9,116	21,330	23,169	537,040,967	452,534,898	1,219,706,121	974,688,684	834,538,961	705,918,383	1,486,764	3,553,329
Michigan	24	23	1,319.33	1,139.65	3,431	2,822	10,681	9,500	114,853,967	123,724,306	188,997,670	95,167,503	593,096,656	371,396,806	2,999,244	2,079,019
Minnesota	10	9	405.66	328.89	1,414	1,139	4,970	4,267	152,469,348	89,236,100	23,860,491	64,132,792	316,904,581	249,490,524	1,891,651	1,912,200
Missouri	20	19	671.38	579.25	3,004	2,683	10,522	9,550	300,988,152	267,790,944	184,192,770	94,203,923	660,703,957	575,813,719	1,363,367	2,266,059
Mississippi	11	12	112.36	107.04	187	197	627	507	20,022,367	9,954,975	3,279,254	3,695,094	12,215,749	12,849,267	*119,442	*38,309
Montana	6	6	100.86	82.37	184	160	486	390	.....	1,800,000	17,927,151	8,426,574	25,948,387	17,430,364	192,667	70,282
Nev. and Utah	7	7	347.77	200.34	518	465	1,552	1,224	.....	34,846,894	40,349,995	45,815,875	48,561,651	48,633,465	*32,332	497,499
New Jersey	39	43	902.09	897.33	3,364	3,061	7,461	9,436	22,895,276	33,198,177	245,049,086	183,471,328	555,286,203	452,964,664	922,985	535,943
No. & So. Dak.	6	5	44.81	37.48	95	93	155	133	.....	36,000	2,203,341	1,621,251	5,169,273	4,827,242	7,929	802,649
Oklahoma	15	18	237.75	214.48	309	300	1,043	791	20,485,313	16,393,772	7,036,876	4,082,454	35,820,508	25,491,981	209,086	*19,753
Oregon	8	6	416.28	389.11	1,431	1,400	3,057	3,041	218,086,315	169,609,004	15,066,427	12,937,739	91,926,694	101,194,838	*628,578	1,069,964
Tennessee	14	12	332.26	259.05	840	872	2,963	3,304	90,682,359	81,760,222	79,354,017	18,312,211	122,655,470	122,188,294	623,690	974,829
Texas	34	40	775.68	579.32	1,403	1,159	4,914	3,611	179,510,988	63,858,530	53,737,334	24,030,667	184,912,268	160,005,067	2,404,340	1,456,572
Vermont	9	9	92.60	96.65	156	155	311	268	11,601,930	6,867,675	10,152,558	2,121,669	9,268,385	8,761,648	35,888	116,061
Washington	20	20	756.94	739.07	1,052	976	5,857	4,761	626,948,720	439,408,062	116,797,063	69,385,927	186,361,737	163,717,821	1,317,209	2,440,762
West Virginia	23	24	421.19	369.53	633	537	2,446	1,939	86,860,542	59,854,180	25,300,487	7,314,054	80,920,697	56,226,800	1,681,481	802,649
New Hampshire	13	13	176.41	217.42	397	368	909	837	5,491,065	5,356,050	11,006,954	12,198,773	26,341,020	26,651,471	69,176	50,628

*Deficit.

Editorial Comment

Membership of State Public Service Commissions

THE state public service commission under present day wide control of public utilities has advanced to a position of high importance in its particular field of operation. Never has there been a time when greater care is needed in the selection of the membership of such bodies. With the advancing costs of production has come the apparent necessity for an increase in the basic rates of different commodities, and applications, almost without number, have been made to public service commissions in all parts of the country for permission to increase the rate to the consumer of electric light, power, water, and so on.

The justice or fairness in allowing or denying such increase is based upon actual operating conditions—because the commission might believe so or say so, or because the public service company might feel so, is entirely apart from the real merits of the case. The only way that equitable action can ensue is by careful and considerate investigations. This work requires men who know—men who are thoroughly familiar with electric power plant, steam power station, boiler room and other utility operation.

The same holds true with other requests of utility companies covering many miscellaneous yet important matters dealing with various factors of production, distribution, finance, etc. State utility boards are designed for the mutual benefit of the citizens and the service company interests, and the "yes" or "no" in the case should be the result of seasoned judgment and experience, plus an actual knowledge of conditions. For these reasons, if for no others, the personnel of state public service commissions, exemplified in the membership, should be fully representative; the members, men of broad experience and training, with certain necessary added abilities, and among them good judgment and discrimination. To be a member of a public service commission for a state and its people, whether with population as large as New York or as small as Idaho, is a big job, and it requires a big man.

An interesting situation has developed in New Jersey as regards the Board of Public Utility Commissioners, as the commission is known in this state, showing the fallacy of the prevailing system in having the appointive power of the membership of the body centered in one man—the governor—as in many of the other states.

With the necessity for appointing two commissioners on the board, positions which allow a very comfortable yearly compensation—enough to interest good engineering and executive ability—we find that selections are made from rather foreign timber than that which might ordinarily be expected to adequately fill the requirements. The first selection covers one who "has operated a lighterage line plying between Hackensack and New York; an expert mathematician now connected with a bonding company"; the second, one who "has served for a number of years as station agent with the Pennsylvania Railroad; at one time secretary and director of a gas company, a water company and a construction company; later, postmaster in a New Jersey town with a population of about 1500, and then county clerk."

The governor, evidently a little in doubt as to how his choice will be accepted by the thinking population of the state, has made a little explanation regarding his selections in sending the names to the Senate for confirmation. In this he says:

"Inasmuch as these are of particular importance and have been so much discussed, I feel the public is entitled to know what has primarily influenced my decision. Three major considerations have appealed to me, all of which, it seems to me, are of paramount importance in the just administration of our public utility laws.

"First, both men have had a ripe experience in public life, and I regard the touch which such experience gives with the public pulse as absolutely essential to the vision which a public utility commissioner ought to have.

"Secondly, both men have had long and varied experience in the direction and management of small corporations, including those engaged in the transportation business, and it is my judgment that men having such experience will prove more valuable to the utility commission and hence to the public and all business concerns than men whose chief claims to recognition might be that they represented this or that great corporation.

"Thirdly, the experience of both men includes that of the employer and employe."

From the viewpoint of the requirements and demands of the office, it would seem that more pronounced qualifications for the duties might be included. Electrical and engineering knowledge would assist, as would also a little legal experience; at least, a few basic fundamentals of electric generation, distributing lines and the general operation of public utilities could be used profitably when it comes to passing judgment on such matters of importance.

Politics, decidedly, should not be allowed to enter into the appointment of members of public service commissions.

Electrical Committee's New Procedure

THE new method of procedure which was recently adopted by the Electrical Committee of the National Fire Protection Association and which was briefly outlined in our last issue, is typical of the progressiveness of this committee. To the casual reader the changes made may not appear to be especially radical or important, but to those who are more closely acquainted with the former methods they mean a much closer co-operation between the committee and the various branches of the industry which will eventually remove many of the objections which have been advanced against the National Electrical Code.

It is true that the Electrical Committee has for many years had subcommittees working in conjunction with it in the formation of the Code, but these subcommittees have been comparatively small and have been limited to the investigation of some special prearranged subjects. The new method provides for ten standing committees, composed of members of the Electrical Committee, each having a certain group or class of items to investigate and having several technical subcommittees, selected from the industry at large, reporting to it. This allows not only a much broader source of information but permits of more active co-operation from the various interests as well.

In the past the committee, limited as it was under the former arrangement, has been admittedly slow in several instances in adopting the latest developments. This was due chiefly to its inability to investigate these matters promptly and with sufficient thoroughness to warrant their inclusion in the Code. The new method with its added facilities will largely eliminate this.

It is also true that the committee, prior to its biennial meetings, has issued a bulletin and held public hearings on any recommendations which have been sent to it. But this bulletin consisted only of a list of these recommendations without their having been considered by the committee or its subcommittees and were only considered by the committee on their presentation at the public hearing. The consideration thus given was of necessity brief and often inadequate. According to the new procedure, each recommendation will be thoroughly investigated and considered by a technical subcommittee and the proper standing committee and the bulletin will consist of the reports of these committees on the subjects considered. In this manner each item will be assured proper consideration and when presented to the Electrical Committee will be digested action instead of a mere proposition.

Despite these former apparent shortcomings, the committee in the past has played a very prominent part in the development of the industry and its Code has become the most widely recognized code of engineering practice in the world. Any movement, therefore, which tends for its betterment should receive the fullest support of the industry. In the application of the new method the committee will require more than ever the co-operation of the various electrical associations and of manufacturers, central stations, etc., and it is to be hoped that this will be freely given, especially in the matter of serving on committees, conducting investigations, submitting reports and other aid which they may be asked to give from time to time.

A Sane View of Electrification

ENTHUSIASM for things electrical has distinguished electrical men from the time that electricity came to be usefully applied to the wants of man. This enthusiasm is only natural because electricity is doing so many things better than they ever were done by other methods before and, moreover, it is accomplishing so much that never before had been achieved. This enthusiasm has also acted as an inspiration to the Edisonian perseverance of our electrical inventors in accelerating the development of the electrical arts. Occasionally, however, it has acted almost as a detriment when it led to inordinate impatience at cases of slow adoption of electrical means.

Steam-railroad electrification is a subject that has aroused the enthusiasm of electrical men to almost the highest pitch, not only because its wide adoption would bring prolonged activity and prosperity to the electrical industry but because it would bring so many benefits to the public in general and to the railroads themselves. In advocating its universal application we have been prone to be carried away by our enthusiasm to the extent of failing to realize that its economies in any case would have to at least balance the interest on the additional investment its adoption would require.

In the agitation and general discussion of electrification electrical men have usually looked at the subject from too limited a viewpoint. It has frequently been assumed that it involved merely substitution of electric for steam locomotives. It has remained for Mr. Calvert Townley to present the subject in a much broader light, which he did in his paper read at the Boston meeting of the American Institute of Electrical Engineers last week. This paper is reproduced on other pages of this issue.

Mr. Townley approaches the subject with a more comprehensive knowledge of railroading than most electrical engineers possess and this keeps him from underestimating the financial features of the problem. Although this aspect has been and still is peculiarly important in view of the difficulties connected with all financing due to the war, it is likely to remain a paramount consideration at all times because the cost of bringing about electrification is so high.

Most electrical men have not realized the full effects of electrification on railroad operation in that it makes possible many valuable innovations in railroading that Mr. Townley points out. And yet, while universal electrification must remain for the very remote future or may never be realized, there are so many opportunities for putting it into effect where it will pay handsomely that the electrical industry may well adopt the sane and practical view of Mr. Townley.

Week's Events

Associated Manufacturers Meet—Institute Discusses Electrification at Boston — New Manufacturers' Association

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES HOLD ANNUAL MEETING IN NEW YORK CITY.

Important Business Session Held on Thursday, March 20—Meetings of Sections Convened Throughout the Week.

The annual meeting of the Associated Manufacturers of Electrical Supplies was held at Delmonico's, New York City, on Thursday afternoon, March 20. The business session opened directly after luncheon at 2 o'clock and various reports of officers and of committees were heard and filed. Business conditions and problems of the day were discussed in these reports. There were also special reports by the International Trade and War Service committees, followed by reports of progress by the chairmen of the various sections of the organization. Officers were re-elected as follows:

President—A. W. Berresford, Cutler-Hammer Manufacturing Co., Milwaukee, Wis.

Vice-President—B. E. Salisbury, Pass & Seymour, Inc., Solvay, N. Y.

Treasurer—James W. Perry, H. W. Johns-Manville Co., New York City.

General Secretary—Charles E. Dustin, Hartford, Conn.

Counsel—Thomas Debevoise, New York City.

Board of Governors—The above named president, vice-president, and treasurer, and the following: Charles Blizard, Electric Storage Battery Co., Philadelphia, Pa.; D. R. Bullen, General Electric Co., Schenectady, N. Y.; H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.; Le Roy Clark, Safety Insulated Wire & Cable Co., New York City; L. W. Downes, D. & W. Fuse Co., Providence, R. I.; J. J. Gibson, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.; E. B. Hatch, Johns-Pratt Co., Hartford, Conn.; H. R. Holmes, R. Thomas & Sons Co., East Liverpool, Ohio; J. F. Kerlin, Corliss Carbon Co., Bradford, Pa.; Warren Ripple, George Cutter Co., South Bend, Ind.; W. C. Robinson, National Metal Molding Co., Pittsburgh, Pa., and R. K. Sheppard, Simplex Wire & Cable Co., Boston, Mass.

Thursday evening a very enjoyable banquet was participated in by a large attendance. A number of interesting speakers addressed the assembly and an excellent musical program was rendered.

During the week, before and after the annual meeting, beginning Monday, March 17, to Friday, March 21, there were a number of meetings of sections of the organization in the association's rooms at 30 East 42nd street, and in the rooms of the Old Colony Club in the Manhattan Hotel, New York City. These important section meetings were presided over as follows:

Industrial and Street Lighting Fixture Section—C. O. Baker, Wheeler Reflector Co.

Signaling Apparatus Section—G. L. Patterson, Stanley & Patterson.

Snap Switch Section—Edward R. Grier, Arrow Electric Co.

Molded or Formed Insulation Section—Joseph Rockhill, General Insulate Co.

Lamp Receptacle and Socket Section—H. R. Sargent, General Electric Co.

Outlet Box Section—F. W. Hall, Sprague Electric Works of General Electric Co.

Attachment Plug Section—C. A. Bates, Bryant Electric Co.

Heating Appliance Section—Fred D. Goode, Cutler-Hammer Manufacturing Co.

Line Material Section—W. R. Williams, General Electric Co.

Air Circuit-Breaker Section—G. A. Burnham, Condit Electrical Manufacturing Co.

Panelboard and Switchboard Section—C. E. Wilson, Sprague Electric Works of General Electric Co.

Fuse Section—R. C. Buell, Johns-Pratt Co.

Knife Switch Section—J. H. Trumbull, Trumbull Electric Manufacturing Co.

Insulating Materials Section—J. G. Miles, Westinghouse Electric & Manufacturing Co.

Fan Motor Section—A. F. Chamberlain, Robbins & Myers.

Electrical Porcelain Section—J. E. Way, R. Thomas & Sons Co.

Rigid Conduit Section—C. E. Corrigan, National Metal Molding Co.

Non-Metallic Conduit Section—Russel Dart, Alphaduct Co.

Armored Conductor and Metallic Flexible Conduit Section—G. F. Holly, Youngstown Sheet & Tube Co.

Magnet Wire Committee of the Wire & Cable Section—B. S. Webb, New England Electric Works.

RAILROAD ELECTRIFICATION DISCUSSED AT BOSTON MEETING OF INSTITUTE.

Calvert Townley's Paper Provokes Much Interest at Large Gathering of A. I. E. E.—Other Papers.

A very well attended and very busy meeting of the American Institute of Electrical Engineers was its 348th, which was held at the Hotel Copley Plaza, Boston, Mass., on March 14. Three technical sessions were held, separated by luncheon and dinner, so that quite a strenuous program was carried out. The morning session, devoted entirely to electrification, evoked intense interest. The afternoon session dealt with telephone topics and the evening session with the relations of science and university training to engineering.

Ira M. Cushing, chairman of the Boston Section, called the morning meeting to order and introduced Governor Calvin Coolidge of Massachusetts, who delivered an address of welcome. After expressing pleasure in having the Institute meeting held in Bos-

ton, Governor Coolidge said: "You are more than electrical engineers; you are ministers to human welfare. It has undoubtedly been your observation, as it has been mine, that a man does not like to be a machine and the only remedy that there is for that condition is the invention and development of machinery to do those hard tasks that men do not like to do. Everybody that has any ambition—and that extends to most of the human race—wants to be not a hand, but a head, and the mechanical operations ought to be done by machinery, and it is in that field that the electrical engineer plays such an important part in the welfare of mankind."

President Comfort A. Adams then took the chair and in part said: "There is a great demand for higher remuneration of labor in all departments—a demand so great that the productivity of labor will not create, under our present conditions, enough wealth to give labor what it desires. Labor does not realize what the limitations are, and the word which I wish to convey to you this morning is just this—that the engineer is in a very vital, if you will, strategical, position as far as this situation is concerned; he is, in a way, the man who has to do with the machinery of production and distribution, and also, in some degree, the connecting link between labor and capital. It is his job to so improve the machinery of production and distribution that the productivity of labor will be high enough to meet the demand."

Calvert Townley presented his paper, "Some Possibilities of Steam Railroad Electrification as Affecting Future Policies." This paper is reproduced on other pages of this issue. Mr. Townley's paper was followed by the showing on the screen of illustrations from a number of examples of railroad electrifications in the United States and Canada.

In opening the discussion on the paper, F. H. Shepard said that the transportation problem is probably one of greatest magnitude confronting the country, and the expeditious and regular movement of traffic is a question which concerns the individual activity of every citizen. In addition, the railroads are the greatest employers of labor and it is of great importance that their operations should be carried on in the most efficient and economical manner. For the proper development of our industries and the success of our activities it was necessary that the broadest vision be exercised in the expansion of our railroad facilities.

The problem of electrification is a vast one, and no one can say to what extent it can be accomplished. The cost would be very great and, looking at the proposition broadly, the sum involved would be of the order of that which would be required to duplicate the present way and duplicate the tracks which now exist. That means an expenditure which, if applied to all the railroads, would amount to something like fifteen billion dollars. The traffic on the railroads doubles about each 12 years. Electrification can in any particular situation double the capacity of a railroad, and the amount of power which can be applied to a train is unlimited. The use of electricity in all branches of industry is a labor-saving device. Electricity may be considered as a new tool and should have the most general application. The electric locomotive operates with a minimum of expense for maintenance and upkeep.

W. S. Murray pointed out that 33% of cargo space on railroads is used for coal haulage, and of that amount 7% is burned on the steam locomotives drawing the coal over the rails. The waste by improper power application on the Atlantic seaboard between Washington and Boston amounts to between $50,000,000 and $100,000,000 a year. Millions of tons of coal are consumed in the propulsion of freight, passenger and switching engines, and this should be contrasted with the saving which could be made by the use of electric locomotives; there is also the great waste in factories in that district by the waste of coal in separate boiler plants compared with the saving which could be effected by the use of regional power stations.

Why is this waste allowed? The speaker had given much thought to Secretary Lane's proposed super-power generation, transmission and distribution plans for application in the regional district between Boston and Washington. By such an arrangement is offered the opportunity of propelling all trains in this region by electricity and at the same time supplying all industrial concerns with like power. He was most thoroughly in accord with this plan. The plan would probably be to use steel transmission towers supporting wires bearing three-phase, 25-cycle current at a potential, say, of 150,000 volts, these lines probably three or four in number running parallel to each other on a private right-of-way. Such lines would be energized through the agency of large unit tidewater steam-electric stations, hydroelectric stations and steam-electric stations located at coal mining centers. It is a practical conception to think of such stations of the steam order furnishing a kilowatt-hour to these lines at a rate between 10 and 15 lb. of steam, the water-power plants furnishing their quota, of course, without robbing the earth of a pound of coal.

Ten years ago the super-power plant would have been impracticable; there was not sufficient supporting traffic, but today those conditions are changed. Millions of dollars must be spent in factory and in field to accomplish the construction of this super-power generation and distribution but it will provide an answer to the need of the returning soldier for employment.

Carl Schwartz, in a contributed discussion, said that 10 years ago the impression prevailed quite generally that the highly successful operation of several systems of steam-railroad electrification then completed was all that was necessary to open the door for the replacement of steam by electric power on a large scale. Few electrical engineers realized, in those days, that the cost of the necessary electrical equipment constituted only a small fraction of the total capital cost of steam-railroad electrification. Many other large and essential items of expense were not fully appreciated or understood; for example, the rebuilding of tracks, the installation of new signal systems, the extensive additions to maintenance facilities, the changes in terminal and switching arrangements, elimination of telephone interferences, etc. Now the problem is, in most cases, how can the necessary return be secured for the additional large investment required for electrification. As matters stand today, generally speaking, electrification would result in an increase in the cost of transportation, he thought, because the additional burden of capital expense cannot be compensated for by a corresponding decrease in the cost of operation and maintenance. However, the use of electricity is a most effective means of increasing the capacity of the transportation machine, and where this applies to the extent of producing additional revenue so as to compensate for the additional investment electric operation readily justifies itself.

N. W. Storer said he did not think anyone could with any degree of comprehensiveness or accuracy say

what will be the ultimate result of electrification in this country. He did not think there was anyone with a broad enough vision to comprehend all the advantages and the things which can be developed from the complete electrification of the large systems. One reason why there has not been greater electrification is because the electrical engineer has not been close enough to the railway situation—he has seen just one part of the problem and sought to solve that part. The thing uppermost in his mind was to get a locomotive or motor equipment which would handle the traffic which the steam locomotive has been doing. That is but one part of the problem and the steam-railroad men cannot be blamed for holding back on electrification. In his opinion, the entire methods of operating the roads which have grown up around the steam locomotive will have to be changed to permit of electrification.

W. B. Potter, in a contributed discussion, said that the investment for equipment is undoubtedly the most influential factor affecting the advancement of electrification. Herein exists the duty and the opportunity of the electrical and the mechanical engineer. A subject of present consequence and of vital importance in the future is the fact that electrification operated from hydraulic power offers the only known method of conserving our limited supplies of coal and oil. The further development of central distributing stations with either fuel or water as their source of power will afford the most direct means of conserving coal and would develop the use of electricity for various industrial purposes.

George F. Sever dwelt on the necessity of the development of water powers for the production of electricity and referred to the greatly increasing prices of coal and oil.

George Gibbs in a contributed discussion said that there are few railroads which can in these times face the very heavy expenditures required for electrification, except to secure immediate and large operating economies, either directly or by an increase in the capacity of the road, or in the stimulation of new business, any one of which or all taken together producing added net revenue sufficient to at least pay fixed charges on the new investment. He did not believe any general electrification was probable, but there may be some case where the direct savings would be sufficient to justify the expenditure.

Charles F. Scott offered the following resolution:

> Resolved, That this meeting heartily endorses the investigation of the power resources and requirements of the North Atlantic Coast region which is advocated by Secretary Lane, and that the board of directors be requested to consider the passage of suitable resolutions and the offering of the facilities of the Institute, in support of the project.

The resolution was unanimously adopted.

The subject was further discussed by John B. Taylor, John Murphy and A. G. Webster.

At the afternoon session the paper on "The Electromagnetic Theory of the Telephone Receiver with Special Reference to Motional Impedance" by A. E. Kennelly and H. Nukiyama was read by Dr. Kennelly. The theory of the telephone receiver offered in this paper is based upon the motional-impedance circle which has been published in various chapters during the last few years. The new theory, which is stated under definite limitations, is a further development, taking into account the m.m.f. produced by the vibration of the diaphragm in the permanent magnetic field. The motional power is shown to be derived partly from the testing alternating current and partly from changes in power expended in the magnetic circuit. The motional-impedance circle may therefore also be regarded as a power circle, with components along three different axes of reference.

This paper was followed by a very extensive address, accompanied by numerous slides and demonstrations, on "The Absolute Measurement of the Intensity of Sound," by A. G. Webster.

These two subjects were discussed by John B. Taylor, T. E. Shea, B. E. Behrend, R. L. Jones and H. W. Osborne.

There was a dinner at 6 o'clock and at its conclusion the following addresses were made:

Dr. Charles W. Eliot, "University Training for Engineers"; Prof. Harry Clifford, "Science and the Engineer"; Prof. E. B. Wilson, "Mathematics and the Engineer"; Dr. A. G. Webster, "The Place of Science in Engineering"; B. G. Lamme, "The Engineer and the University," and Dr. Saul Dushman, "Our Mental Attitude Towards Scientific Investigation."

ELECTRICAL MANUFACTURERS' EXPORT ASSOCIATION FORMED.

To Promote and Take Care of Foreign Business of Non-Competitive American Electrical Producers.

The Electrical Manufacturers' Export Association of the United States of America was formally organized at the Hotel Manhattan, New York City, on March 18. A preliminary meeting of the manufacturers was held at the University Club, New York City, on the evening of Feb. 27. At this meeting a plan for the organization of the Electrical Manufacturers' Export Association was outlined by F. E. Watts. A committee was appointed to draft the constitution and by-laws, and to incorporate such an institution under the laws of the State of New York. This was done and the constitution and by-laws were adopted at the meeting held on March 18. At the same meeting the following officers were elected:

President—F. E. Watts, of F. E. Watts, Inc.

Vice-president—H. H. Cudmore, of the Argus Lamps & Appliance Co.

Treasurer—D. R. G. Palmer, of the A. A. Wire Co.

Secretary—W. B. McCurdy, of the Good Manufacturing Co.

A board of nine directors, who will act as the governing body of the association, also was chosen at this meeting.

This association is for membership only and is composed of electrical manufacturers in non-competing lines. Its purpose, as stated in the constitution, is as follows:

"(a) By co-operative effort to facilitate the exportation of electrical apparatus, appliances and materials, as manufactured by the several members of the association from the United States to foreign countries.

"(b) To investigate the commercial conditions in foreign countries as affecting trade, to secure all data, statistics, samples of competitive goods and prices of same, to enable the members of the association to more intelligently compete for trade in foreign markets.

"(c) The protection and perpetuation of trademarks of the members in foreign countries, and the maintenance of a line of direct contact and service plan from maker to user.

Over thirty prominent electrical manufacturers are already members of the association, and a number of others have applied for membership. A roster of

manufacturers who are already members is being prepared and will shortly be ready for publication.

The primary object of the association is to consolidate the export work of the several members, to investigate the possibilities of sales, and to develop foreign interest in the electrical products of the manufacturers while, on the other hand, giving to the foreign buyer a complete line of electrical products from one source so that he may make his purchases with one selling agency rather than a great many.

F. E. Watts, Inc., 30 Church street, New York City, has been made the selling representative for the individual members of the association, and all sales will be conducted through the above organization.

This company has already established agencies in the Scandinavian countries, Holland, France, Italy, Roumania, Spain, South Africa, China and Japan, and will have its own branches in England, Australia, New Zealand, Cuba and Mexico.

Only the products of the manufacturers of the association will be handled by F. E. Watts, Inc., whose agencies will actively promote the sale of the goods manufactured by the members of the association.

F. E. Watts, Inc., is organized to handle all credits, freight forwarding, investigation of the possibilities of the sale of products in various countries, has a legal department for the purpose of settling disputes and claims, for registering in foreign countries trademarks, copyrights and patents of the various manufactures.

F. E. Watts will leave in April for a three-month trip to European countries for the purpose of making a personal investigation of the possibilities of sales of the products of the various manufactures and a further development of the agencies already established in foreign countries.

PLANS FOR N. E. L. A. EXHIBIT PROGRESSING.

Some Space Still Open But Prompt Action Is Urged by Committee.

As announced in previous issues, the Exhibition Committee of the National Electric Light Association has planned a comprehensive exhibit to be held on the Million Dollar Pier, Atlantic City, N. J., coincident with the convention of the Association, May 19 and 23.

The accompanying floor plan shows the layout of exhibit space and its reference to the meeting halls where all sessions will be held. Secretary McConnaughy reports that owing to the limited amount of space, although it is double the amount used in previous years, it will be well for manufacturers who wish to exhibit to make application at the earliest moment.

The personnel of the Exhibition Committee is as follows: J. W. Perry, chairman, H. W. Johns-Manville Co.; Charles Blizard, Electric Storage Battery Co.; S. E. Doane, National Lamp Works of General Electric Co.; F. H. Gale, General Electric Co.; J. F. Gilchrist, Federal Sign System (Electric); J. C. McQuiston, Westinghouse Companies; John Mustard, Wagner Electric Manufacturing Co.; C. L. Peirce, Jr., Hubbard & Co., and F. R. White, Baker R. & L. Co.

H. G. McConnaughy, secretary, is maintaining headquarters at 1111 Munsey building, Washington, D. C., where all communications should be addressed.

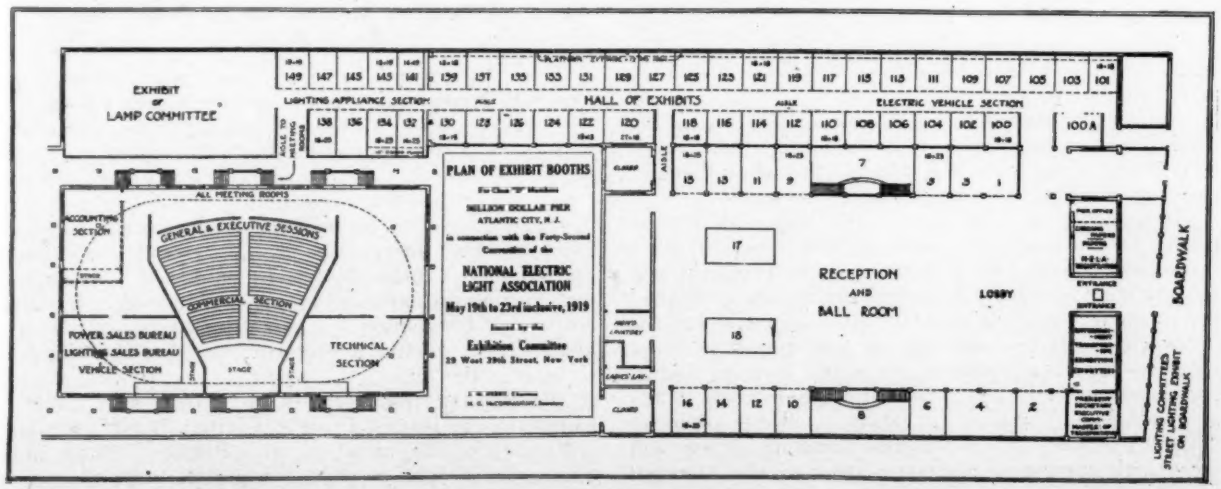
JOBBERS HOLD MEETINGS AT NEW YORK AND CHICAGO.

Central and Atlantic Divisions Elect Officers and Discuss Current Events.

The Electrical Supply Jobbers' Association held three interesting and well attended meetings last week. On Tuesday, March 11, the members of the Atlantic division held an all-day meeting at the Hotel Commodore, New York City. On Wednesday, March 12, the Central division held its meeting at the La Salle Hotel, Chicago, and the Executive Committee put in a busy day at the same headquarters on the following day.

Routine matters were discussed and reports of standing committees received at the meetings of both Atlantic and Central divisions. As the reports were of an interim nature and for information only, no definite action affecting trade relations was taken. One of the principal topics at both meetings was that the Government should dispose of its surplus stocks in such a manner that the market would not be affected.

The Central division proceeded to an illuminating discussion of carrying expense of salesmen, stenographers and typists, operating expenses and other incidentals of overhead. The information thus developed indicated the desirability of establishing similar and other figures of a concrete nature to be used as a basis



for revealing the economy of jobber distribution and these will be secured and probably made a feature of the summer meeting, which will be held at Hot Springs, Va., June 10, 11 and 12, 1919.

W. I. Bickford, Iron City Electric Co., Pittsburgh, Pa., was elected chairman of the Atlantic division. H. T. Hochhausen, Brooklyn Electrical Supply Co., Brooklyn, N. Y.; A. M. Little, Mohawk Electrical Supply Co., Syracuse, N. Y.; J. V. Garron, Philadelphia Electrical Co., supply department, Philadelphia; F. S. Price, Pettingell-Andrews Co., Boston; J. G. Johanneson, Southern Electric Co., Baltimore, Md., and G. W. Provost, Union Electric Co., Pittsburgh, were elected members of the Executive Committee.

W. R. Herstein, Electric Supply Co., Memphis, Tenn., was elected chairman of the Central division. W. W. Low, Electric Appliance Co., Chicago; G. W. Johnston, Mid-West Electric Co., Omaha, Neb.; N. T. Harvey, Illinois Electric Co., Chicago; P. Stern, Interstate Electric Co., New Orleans; F. D. Van Winkle, Post-Glover Electric Co., Cincinnati, and H. F. Thomas, Northwestern Electrical Equipment Co., St. Paul, Minn., were elected members of the Executive Committee of this division.

A pleasant feature of the meetings, both at New York and Chicago, was the return to active association of Thomas M. Debevoise, counsel of the Electrical Supply Jobbers' Association. Mr. Debevoise has been inactive for nearly 17 months as a result of a long period of unselfish and unsparing devotion to his work. His restoration to health and reappearance among his friends were signals for many hearty felicitations.

MANUFACTURERS OF MATERIAL-HANDLING MACHINERY FORM ASSOCIATION.

Technical Studies to Be a Leading Activity—Port and Terminal Problems to Receive Particular Attention.

Following the suggestion of the Department of Commerce and the U. S. Shipping Board there has been completed the organization of an association of manufacturers of machinery for handling materials. The suggestion was made by the two government agencies because of the need for intensive study of the freight handling methods at both railroad and ocean terminals. By mobilizing the experience and ability of all manufacturers of handling devices in a single organization, the Government will not only be able to reach this industry in an effective way when it needs co-operation, but the industry itself can more effectively attack the large and difficult problems presented at terminals and ports.

While the immediate cause for organizing is the need for intensive study of the handling of materials at terminals, the body will take up the whole field of material handling and thus touch every industry.

In general the lines of work—technical, educational, promotional, etc.—will parallel those of other trade associations, but the nature of the problems will require more extensive technical committee work than is customary in such bodies. In one particular the proposed work presents an unusual phase. Since material-handling problems are found in every industry, relations will be cultivated with existing trade associations. These organizations will be asked to appoint committees on material handling which will meet with corresponding committees of the Material Handling Machinery Manufacturers' Association, as the new association will be called. Thus the material-handling problems of the various industries will come before broadly representative committees of material-handling experts. Already several of these co-operating committees have been arranged for.

The active conduct of the association's work will be in the hands, as secretary and manager, of Zenas W. Carter, formerly commissioner of the Associated Metal Lath Manufacturers, and previously field secretary of the Granite Paving Block Manufacturers' Association. The officers of the association are: President, Calvin Tomkins, formerly commissioner of docks, New York City; vice-president, J. A. Shepard; treasurer, Lucian C. Brown; directors, Mr. Shepard, Mr. Brown, R. W. Scott, F. W. Hall, William Clark, J. C. Walter, C. M. Watson and Fred Stadelman. Four additional directors are to be chosen when the charter membership is completed.

The following companies have come together in the work of forming the organization and are now constituting themselves a membership committee to complete the charter membership of the association:

Watson Elevator Co., Edw. F. Terry Mfg. Co., International Conveyor Corp., Rownson, Drew & Clydesdale, Inc., New Jersey Foundry & Machine Co., Hayward Co., Elwell-Parker Electric Co., Sprague Electric Works, Otis Elevator Co., Manning, Maxwell & Moore, Inc., Robins Conveying Belt Co., Michener Stowage Co., New York City; Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.; Brown Portable Conveying Machinery Co., Chicago, Ill.; Karry-Lode Industrial Truck Co., Long Island City, N. Y.; Whiting Foundry Equipment Co., Harvey, Ill.; Wellman-Seaver-Morgan Co., Cleveland, Ohio; Alliance Machine Co., Alliance, Ohio; Alfred Box & Co., Inc., Philadelphia, Pa.; Meade-Morrison Mfg. Co., East Boston, Mass.; Alvey-Ferguson Co., Cincinnati, Ohio; Heyl & Patterson, Inc., Pittsburgh, Pa.; American Hoist & Derrick Co., St. Paul, Minn.; Cleveland Crane & Engineering Co., Wickliffe, Ohio; Clyde Iron Works, Duluth, Minn.; Ohio Locomotive Crane Co., Bucyrus, Ohio; Northern Engineering Co., Detroit, Mich.; Electric Controller & Mfg. Co., Cleveland, Ohio.

Offices have been opened at 35 West 39th street, New York City.

WISCONSIN ELECTRICAL ASSOCIATION TO HOLD ANNUAL CONVENTION.

Interesting Program Arranged for Milwaukee Meeting on March 26 and 27.

The Wisconsin Electrical Association will hold its eleventh annual convention at the Hotel Pfister in Milwaukee, Wis., March 26 and 27. This meeting will be held in conjunction with the annual meeting of the Wisconsin Gas Association and a very attractive program has been provided.

An effort is to be made at this session to create more general interest in the street and interurban operation. A plan has been suggested whereby a better organization can be provided to look after this feature of convention work and it is especially desirable that street and interurban operators be on hand to discuss the plan.

At the afternoon session on Wednesday, Chester Corey, of the Harris Trust & Savings Bank, Chicago, will address the members on "Public Utilities and Securities." John S. Allen of the Railroad Commission of Wisconsin, will speak on "The Value of the

Quality of Service," and George P. Hambrecht, of the Wisconsin Industrial Commission will explain the workings of that body. An informal banquet will be given in the evening to the members of both associations.

The Thursday morning session will be devoted entirely to the program of the Electrical Association. At this session Frank A. Robbins, Superior Light, Water & Power Co. of Superior, Wis., Alfred Alfaker, of Chicago, H. L. Andrews of the General Electric Co., and A. J. Goedjen, statistician for the Wisconsin Public Service Co., Milwaukee, will address the members on various subjects of interest.

MINNESOTA ELECTRICAL ASSOCIATION HOLDS ANNUAL MEETING.

Large Gathering at St. Paul Takes Up Problems of Reconstruction With Vigor.

The annual convention of the Minnesota Electrical Association was held at the Saint Paul Hotel, St. Paul, Minn., on March 18-20. This meeting had the largest attendance of any convention held by the association during the twelve years' annual meetings have been held by it. The spirit of the meeting was that of taking up again in all earnestness the work that was held in abeyance during the more pressing business of waging war. This spirit of "readjustment" not only was shown by the program presented, but also by the exhibits.

The many manufacturers who had exhibits and representatives at the convention all expressed the opinion that the buying that has not been going on must start soon. That the manufacturers and jobbers have a high opinion of the buying power of the Twin Cities and surroundings is indicated by the number of exhibitors. The exhibit embraced all the various lines from outdoor substations to precision electrical instruments, lamp shades to sterilizers and vacuum cleaners. The varieties of electrical heating devices shown was surprising.

ANNUAL MEETING OF WESTERN RED CEDAR ASSOCIATION.

The fourteenth annual meeting of the Western Red Cedar Association was held at Sandpoint, Idaho, on Feb. 20. Reports were presented by the officers who stated that the financial and other affairs of the association were in good condition. W. M. Leavitt, chairman of the Advertising Committee, reported at length regarding the publicity campaign conducted in various electrical papers, which has been found to give very good results. It was decided to continue this campaign about on the same lines as it has been conducted. A committee was appointed to confer with the members of the Lifetime Post Association to secure a co-operative arrangement whereby a competent man would be engaged to look over stocks of posts, piling and poles both in the woods and at the different landings and yards of the member companies so as to give suggestions for improving the quality of stock that is being produced and shipped. Some discussion was indulged in regarding the reduction in rates on shipments of poles and piling.

The election of the officers for the ensuing year resulted in the choice of the following: President, R. G. Jones; vice-president, J. M. Montgomery; directors for one year, L. E. Hill, H. J. Searl and E. L. Clark. The board of directors met directly after the conclusion of the meeting and reappointed J. E. Seaman as secretary and treasurer.

"ELECTRIFY-YOUR-HOME" MOVEMENT STARTED.

April 1 to May 15 Set for Campaign for Wiring of Existing and Proposed Houses.

At a meeting held March 12, in the offices of the Society for Electrical Development, Inc., it was the prevailing opinion of the attending representatives from the individual branches of the industry, so spoken for, that a house-wiring campaign was needed and would be timely. As briefly mentioned in last week's issue, the scope of the campaign includes the wiring of houses now built but un-wired, the wiring of houses that are contemplated or under construction also a drive for the wiring of industrial and commercial buildings.

A suitable campaign of this kind is being waged by the Cleveland (Ohio) Illuminating Co. The company has been co-operating with the contractors for some months to promote the business of wiring completed houses. Schenectady, Scranton, Toledo and other cities have plans under way or contemplate inaugurating immediate campaigns.

It was shown that it would be better to inaugurate the campaign at this time rather than to wait until the fall or later, because such a stimulus is needed and desired by the industry generally. It was also the opinion that no better time could be selected for approaching the average house-owner prospect than right now. The statement also was made by manufacturer representatives that they did not believe there would be further reductions of material prices and that there was an uncertainty of labor wages decreasing. It was felt, on the contrary, that labor costs would be greater, thereby offseting any possible reduction in material prices. Another important point brought out was that home owners and builders must be shown that they will not gain materially by withholding decision to wire or build their houses, and this will be a feature of the campaign.

House-wiring orders for the most part do not come into the store or shop unsolicited—the average house-wiring prospect *must be sold*. And the forthcoming campaign is built around this fact.

The selling and advertising helps for use in the campaign comprehend every reasonable requirement. One feature is the portfolio which the society will distribute and which will contain descriptions of all the sales and advertising helps, as well as explaining the what, why, when and where of the campaign—the "how to's" in other words. This elaborate portfolio will be sent free by the Society upon request. The campaign material includes all necessary advertising illustrations, printed matter, slides and complete window trims. As in previous national campaigns, the majority of the material will be supplied free to members of the Society, and to non-members at cost prices.

The window trim, consisting of three pieces—*i. e.*, one cut-out, one poster and one streamer—will be printed in three colors. The lamp companies' representatives agreed to purchase and distribute window trims to their agencies. The representatives of the electrical press agreed to aid in every way possible in putting over the campaign. Representatives of the national electrical organizations and associations also are being depended upon to put their whole support and effort behind the campaign.

Commercial Practice

Optimistic Outlook for Future Central-Station Business—Utilities Upheld by Business Men—Metermen Organize

BUSINESS MEN SAY UTILITIES SHOULD BE PROTECTED.

Bangor Chamber of Commerce Urges Study of Conditions—Finds Majority of Securities Held by Public.

The appended resolutions, recently adopted by the Bangor (Me.) Chamber of Commerce, are of more than passing interest as indicative of the public attitude regarding public utilities and increased costs of operation, even in the conservative New England section.

The following are the resolutions adopted by the Bangor Chamber of Commerce:

Whereas, The Bangor Chamber of Commerce feels that the country is facing a grave situation in regard to public utilities; and

Whereas, It feels that all citizens are vitally interested in the well-being of the public utilities; and

Whereas, It feels that on its organization and on similar organizations throughout this entire country rests a grave responsibility in this regard; now, therefore, be it

Resolved, That the Bangor Chamber of Commerce, realizing that its duty is to study the question, both in the state of Maine and elsewhere, desires to make known to its members and to the citizens of this community the result of its study.

That as a result of that study the Bangor Chamber of Commerce finds that a substantial part of the funds of the savings banks is invested in bonds of public utilities; that the depositors of mutual savings banks are in reality part owners of every such investment; that the same is true of the life-insurance companies, both as to investment and ownership; that the present and future well-being of every community is directly dependent upon the successful running and further development of the public utilities operating in its locality; that every such community should be anxious to see that the conditions under which such public utilities are operating are such as to allow the companies sufficient revenue to protect properly the public from accidents, to keep their lines in good condition to render efficient service to the public, to make further needed developments, and to guard safely the property ownership of the investing public.

The Bangor Chamber of Commerce feels that a much graver responsibility rests with the public service commissions; that their sworn duty is to see that the public utilities are properly and efficiently run; that they are responsible for the credit, continuity and general well-being of the public utilites; that every public service commission should be upheld and backed where it has recognized such responsibility; that where commissions have not so recognized this duty, the public should insist that they do.

The Bangor Chamber of Commerce urges every Board of Trade in the state of Maine to start at once a study of this question, to urge the National Chamber of Commerce at Washington to give space in *The Nation's Business* to this question, to ask the National Chamber of Commerce to urge every member of the national association to study this question and to make known, through publicity in the same channels, the result of this study.

The Bangor Chamber of Commerce also urges the Bangor Rotary Club to take this up with its national association in the same manner. The Bangor Chamber of Commerce feels that an intelligent study of this question by the business men of the country, with a campaign of publicity as to the results of this study, will aid greatly in solving rightly this very grave problem.

OIL PUMPING PROVES PROFITABLE LOAD FOR TEXAS COMPANY.

Wichita Falls Electric Co. Supplies Much Power for Pumping and Swabbing Oil Wells.

Electric power is being extensively used for operating oil well pumps in the Burkburnett field. The Wichita Falls (Tex.) Electric Co. extended its power transmission line to the new oil-producing field and is now supplying more than 40 producing concerns with power for pumping their wells. Some of the oil operating companies have installed as many as 15 electric motors upon as many wells. Electric power is also used for "swabbing" the wells and it is to be adopted for drilling wells as soon as the necessary equipment can be obtained, it is stated.

F. N. Lawton, general manager of the Wichita Falls Electric Co., says the transmission system is being extended to various points in the Burkburnett field, outside of the Burkburnett townsite, where many producing wells are situated. In a recent interview he said:

"The electric power system of pumping and swabbing the wells is proving attractive to oil men because of the economy of the method and the decided reliability of such service as a protection against fire and exposure."

The city council of Burkburnett is strongly recommending the use of electric power because of the elimination of fire hazards.

"Burkburnett also is to have a new water supply from wells located near the Red River," said Mr. Lawton, "and these pumps will be operated by electric motors from a line to be extended from the substation at Burkburnett. The substation will be enlarged in order to take care of the numerous branch circuits which will distribute power to the oil field.

"At present the electric method is being applied only to wells directly in the townsite, but arrangements will be made to extend the service. Burkburnett is the only oil pool in Texas, except on the Gulf coast, where the use of electric motors for pumping and swabbing has been adopted."

The Outlook for Central-Station Business During 1919

By ERNEST A. EDKINS

General Manager of Electric Shops, Commonwealth Edison Co., Chicago.

ALTHOUGH the year 1919 is only two months old, and may, therefore, seem rather too young for any safe prediction as to its future, it is perhaps permissible to observe that one-sixth of the year has now become a part of the irrevocable past and may be of some value in helping us to determine what we may expect for the balance of the year.

Abnormally high prices ushered in the new year with only a very remote prospect of appreciable declines. There was apparently a tendency on the part of retailers to postpone purchases as much as possible, and this tendency was in some measure justified by the rather forbidding conditions with which business was confronted—such, for example, as the menace of widespread labor disturbances, the huge stores of materials accumulated by the Government, which would probably have to be thrown on the market sooner or later, the excessive freight rates, and in many cases the utter inability of manufacturers, particularly in our own industry, to offer lines of new goods or even complete lines of old goods.

E. A. Edkins.

On the other hand, however, the record-breaking sales of electrical appliances of every description during the year 1918 naturally caused central-station sales managers, and to a very large extent retail electrical dealers in general, to face the new year with no little courage and optimism, particularly as the remarkably heavy sales during the last two months of 1918 had practically exhausted existing stocks of goods. Reports received from a number of central-station sales managers early in February indicated an astonishing increase in January sales as compared with the sales for the same period in 1918, and these men were further confirmed in their decision to place liberal orders covering at least 60 and 90-day requirements, by well authenticated information from many other sources indicating a strong buying movement in electrical appliances throughout the industry.

There may be here and there a few ultra-conservative companies and dealers who still adhere to the wartime policy of pulling in their horns, sitting tight, and waiting for something to happen; but these concerns will soon be compelled by force of circumstances to adopt more courageous policies if they do not wish to be hopelessly outdistanced by their more enterprising competitors.

Last year there were few central-station companies in a position to take on any considerable amount of power business, and fewer still who were able or willing to negotiate new capital for additional line and plant investment. With the principal source of increased annual gross business thus curtailed, the importance of going after an increased business in the sale of appliances became at once apparent. It seems scarcely necessary to point out that the wide diversity-factor in the use of electrical appliances makes it entirely possible to add a tremendous number of appliances to existing lines without involving any additional expenditures for generating or distributing equipment. Those central-station companies who realized and grasped this opportunity last year were handsomely rewarded for having the courage of their convictions.

With no definite prospect of early reductions in the cost of apparatus and building material, central-station companies will undoubtedly be slow this year to undertake any considerable extensions of their properties, so that the need for a more intensive development of our appliance sales is just as urgent this year as it was in 1918, while the outlook for larger and larger sales seems even more promising.

In the welter of changed conditions brought about by the late war, there is one economic fact which we should not overlook. The large class of women who have heretofore been employed as laundresses, cooks, maids, etc., are becoming more and more disinclined to continue in this line of domestic service. The revolt, in fact, has already become so widespread as to be a cause of acute embarrassment and discomfort to millions of households in this country. Perhaps some day we shall find women more reconciled to domestic work; perhaps some day we shall find labor more reconciled to a lower standard of living than it now enjoys; but that day at the present moment seems very remote and may safely be disregarded in any calculations covering the next few years.

How does this situation affect our business? Obviously, it seems that the golden age of electricity is about to dawn. There has been much visionary talk in the past about "Electricity—the universal servant of mankind," but now it appears that we are about to have this dream realized beyond the wildest flights of press-agent imagination. The great middle-class public of this country has reached the end of its patience and the

limit of its pocketbook in trying to meet the extortionate demands and insolent exactions of domestic help. Already the reaction has set in and is significantly reflected in the rapidly increasing demand for all kinds of electrical household labor-saving devices. Rather than any longer suffer the irritation and extravagance of incompetent washerwomen and lazy, untrained housemaids, the average woman is deciding to solve her domestic problems electrically. Hence, the remarkable increase during the last few months in the sale of washing machines, grills, percolators, toasters, ironing machines and other electrical devices designed to simplify household work.

A form of community laundry service is now being planned and tried out in several cities. There are also movements on foot for the establishment of community kitchens in apartment buildings. These movements are certainly indicative of the economic pressure of the servant problem. If servants as a class are headed for higher wages and more congenial occupations, there is no escaping the conclusion that electrical appliances *must* be depended upon very largely for the solution of these new working conditions in the home.

At no time in the history of the industry has there been more urgent need for broad vision, liberal sales promotion policies and vigorous initiative on the part of central-station companies and all other agencies engaged in the sale of electrical appliances to the ultimate consumer.

Last year a small group of enterprising central-station sales managers showed what could be accomplished in developing a very large sale of popular priced portable lamps. The same splendid opportunity exists today in the appliance field; it is staring the manufacturers in the face and will undoubtedly be recognized by them, some day, sometime, *when they get ready to see it.*

SHORT COURSE FOR METERMEN BRINGS GOOD RESULTS.

Iowa Metermen Form New Association to Continue Work Started at State College.

In compliance with the requests of a number of the central-station companies of Iowa, the engineering extension department of Iowa State College at Ames recently completed a four-day free course for electric meter men. This course was the initial one of its kind offered in Iowa, if not in the United States. It proved of special interest to employes of those companies who do not find it possible to provide training for meter testers, although there were many plant owners among those registered. Thirty-five men, representing nearly as many different companies, were registered.

The engineering extension department had direct charge of the course. Prof. F. D. Paine, of the electrical engineering department, had charge of the instruction work and he was ably assisted by Prof. A. B. Campbell of the engineering extension department, and C. C. Crawford, formerly of the meter department of the Upper Iowa Power Co.

The instructional work consisted of lectures, discussions, demonstrations and laboratory work. The lectures and discussions were based on a list of questions which applied to the construction, operation, testing and repair of the important makes of meters. The laboratory work followed this same plan and the men were able to put into practice the important points which they were studying. Rotating standards were used throughout the entire course. Special emphasis was placed on the benefits of accurate registration, the results obtained through good service, and the relation of the metermen to the consumer.

In connection with the short courses the different manufacturers placed on exhibit the latest types of meters and loading devices. Specialists from these companies gave very interesting talks on the development, construction, testing and manufacturing of the induction type of meter. The electrical engineering department had a historical exhibit showing the many stages of development from the lamp-hour meters to the present types.

At the conclusion of the session those in attendance formed the Iowa Electrical Metermen's Association. The primary purpose of this organization is to continue the work which was begun at this course and to place before its members the important features relative to the operating, testing and repairing of meters and to form a closer relationship with the business and operating part of the central-station business.

Prof. F. D. Paine of the electrical engineering department was elected the first president and George T. Gibson of the Gibson Electric Co., Box 408, Des Moines, Iowa, was elected to the combined offices of vice-president and secretary-treasurer. Committees are being appointed to complete the organization. It is planned to hold at least annual if not semi-annual conventions.

BOSTON CENTRAL STATION TO AID IN HOUSE-WIRING CAMPAIGN.

A letter recently sent to electrical contractors by the sales department of the Boston Edison Co., presenting the possibilities of a house-wiring plan on monthly payments, has met with sufficiently favorable response to warrant the statement that the plan will go into effect.

The company's house-wiring plan, in operation nearly 4 years, resulted in wiring 5878 residences at a total wiring expense of $577,187.06.

The company will no longer undertake this plan of financing, but the facilities of the sales organization will be employed in selling the house-wiring idea and getting the prospects in touch with electrical contractors.

The contractors have been asked to file their schedule of prices at which they would be willing to wire houses, basing their prices on the return of their money in ten monthly payments. This plan seems, based on experience, to be as satisfactory as the plan of taking contracts for wiring without any time payment stipulated.

The Missouri Senate Committee on private corporations has reported favorably a bill intended to settle a question as to the power of the Missouri Public Service Commission over the rates charged the United Railway Co. of St. Louis and the Union Electric Light & Power Co. of St. Louis for electric current generated at Keokuk. While members of the Commission believe that it now has that power, there has been some uncertainty because the current comes from another state. Senator Gardner has said that he was confident that the Commission could, if the bill should become a law, set aside any unjust or unfair contracts which St. Louis public utilities might have made for Keokuk power.

Operating Practice

Automatic Spillway Gates—Safety Nozzle—Underground Transformer Vaults—Crossing Span—Study of Dielectrics

AUTOMATIC GATES FOR PROTECTING SPILLWAYS.

Automatic Features Would Prevent Many Washouts of Dams and Spillways.

The wider use of automatic spillway gates would prevent many of the washouts that have occurred. Ordinary spillway gates operated by machinery are susceptible to failure due to failure of the machinery or the human element controlling it. This is more likely to be the case where there is much debris to be handled, where there are large masses of ice, because of the possible damage to mechanisms and distraction of human attention to other matters. The great advantage of the automatic spillway gate is that it acts when wanted and when conditions are such that it should operate. It is far less susceptible to damage also.

The automatic spillway gate operates under water pressure, a force that never fails. The operation of a properly designed movable dam of the hinged leaf type is more satisfactory than any other form of submerged movable dam crest known. The hinge is well below the water level and can be readily protected from cold and mechanical injury. Means of heating, usually by steam, are easily applied. Any gate of the hinged leaf type opens easily and surely, as the pressure of water always tends to move the gate to the open position. Even when frozen up, the water pressure behind these gates is able to easily shear the ice along the sides of the gate and open the spillway. Some of this type of gate have been in use eleven years without trouble or need of attention, two examples of which are the 40-ft. two-hinged gate, 3½ ft. high at the Croton Dam, Mich., the other at the Webber Dam, also in Michigan, this latter being 60 ft. long and 5 ft. in high. Both gates are counterweighted and motor operated for closing. The automatic Fargo gate at Webber Dam is used at times of high flood to supplement ten Tainter gates each 20 ft. by 13 ft.

The automatic gate is extremely sensitive. An inch rise in the water-level is sufficient to start the gate, which is completely stable in all positions and only opens far enough to discharge an amount of water equal to the flood discharge. The balance beams may be supported on rollers, and the lower hinges of the gate constructed as knife edge bearings, in order to diminish the frictional resistance. To support large spillways gates on knife edge bearings is a somewhat novel construction but has been entirely satisfactory.

Automatic gates also permit of compulsory service, when the gates may be moved by hand, either for the purpose of letting the water out of the pond or to wash out the sill. In such cases the gates are provided with hoists, by means of which they can be moved at any time. Gates of small dimensions are provided with a tackle on each lever; on gates of greater dimensions hoists are mounted on the counter-weight and from the connection between counter-weight and suspension. During the operation of the hoists, the counter-weight lies on its supports, while the flap can be raised or let down.

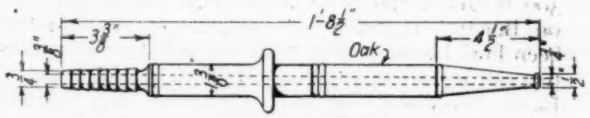
By an adapted displacement of the point of suspension of the counter-weight, the automatic gates can be constructed for the maintenance of different water levels. This construction consists of a simple archimedian screw and wheel work and can be operated by hand as well as electrically from the power plant.

SAFETY AIR NOZZLE FOR USE ROUND LIVE APPARATUS.

Wooden Air Nozzle Reduces Hazards to Persons, Apparatus and Service.

Compressed air is used almost universally for cleaning out the rear of switchboard, oil circuit breakers, rotating apparatus such as synchronous motors and converters, insulators, etc. This air operates at a pressure varying from about 60 to 100 lb. with an average of around 80 lb. probably.

The air is usually piped by hose to a nozzle, which is directed upon the surfaces to be cleaned. If the



Air Nozzle Used by Philadelphia Electric Co. for Cleaning Electric Apparatus with Compressed Air.

air nozzle is of iron pipe, as it often is, care must be exercised that short-circuits do not occur, or that the operator holding the nozzle does not receive a shock. Taping gas pipe is often resorted to, but this is only a hit or a miss method.

The accompanying illustration shows a form of nozzle employed by the Philadelphia Electric Co. for cleaning electrical apparatus. The illustration is self-explanatory. The nozzle is safe and its use does not subject the operator, apparatus or service to the dangers accompanying short-circuits or shocks.

CONSIDERATIONS INVOLVING LOCATION OF UNDERGROUND TRANSFORMER VAULTS.

Convenience, Safety to Apparatus and Public, Factors to Be Considered.

In laying out underground systems for distribution there are many things that may not receive the consideration their importance warrants. Some are matters of convenience, and cost nothing. Transformers and 2300-volt apparatus should be installed in vaults, and the low-tension junction boxes in the manholes. In this way there is less liability of burn-outs and less

chance of trouble being communicated to the secondary network. The mains will also be shorter and less conduit will therefore be required between vaults and manholes. It is generally necessary, and usually preferable, to build two manholes at important street intersections in this way overcoming obstructions such as gas, water and sewer pipes, car tracks, etc.

Under the sidewalk will usually be found the most convenient location for the transformer vaults, the vaults being preferably located on the same side of the street as the main conduit. In this way there is less liability of damage from flooding, the transformers can be more easily and quickly moved with less interference to and damage from vehicular and pedestrian traffic and cold weather, with ground frozen and snow covered is less deleterious. In placing transformer vaults under the sidewalk care should be taken that the vault manhole covers finish smooth with the sidewalk and offer neither obstruction or slippery surface to passers-by.

Whenever possible it is best to locate the conduit 5 ft. or so from the curb, in this way keeping the service box covers out of the gutter. If possible the conduit should be located outside of gas and water pipes, thus saving troubles due to having to sandwich the conduit around the service pipes.

INTERSTATE POWER SYSTEMS CONNECTED OVER MISSISSIPPI RIVER.

Iowa, Wisconsin and Illinois Plants Joined by 33,000-Volt Line Over River.

A three-phase power transmission and tie line of 33,000 volts is being hung across the Mississippi river between Prairie du Chien, Wis., and McGregor, Iowa. The west end is anchored on the top of Point Ann 300 ft. above the river at McGregor. In midchannel on Bergman's Island a steel tower 125 ft. high has been built. The big cable as it extends from the hilltop to the tower will span 2500 ft. of channel width. East of the tower the line is carried over islands and sloughs to the Wisconsin mainland south of Prairie du Chien, thence over the bluffs. As soon as work is completed, which will be in about two weeks, southwestern Wisconsin and northeastern Iowa towns will receive their electric light and power from two common sources, the Upper Iowa hydroelectric plant at Decorah, Iowa, and the big steam plant of the Interstate Light & Power Co. at Galena, Ill.

The consolidation of electric light and power service in northeastern Iowa and southwestern Wisconsin has been in progress for a couple of years, dating back to the purchase of the McGregor and Monona plant from G. S. Donaldson by the Mid-Continental Utilities Co. The company has been gradually taking over local concerns in Wisconsin and Iowa and a short time ago bought the water-power plant on the Upper Iowa river at Decorah, which for a number of years had been supplying some 25 Iowa towns. Recently the Mid-Continental Utilities Co. re-incorporated under the name Interstate Light & Power Co. and began the construction of a high-tension power transmission line from Lancaster, Wis., to Prairie du Chien to connect with the Iowa system across the Mississippi at McGregor. The new system, as soon as consolidation is entirely completed, will be one of the largest in the upper Mississippi Valley. Headquarters will be at McGregor.

Among towns on the line will be Lancaster, Fennimore, Boscobel and Prairie du Chien in Wisconsin, and McGregor, Monona, Postville, Decorah, Calmar, Ossian, Waukon, Lansing and Cresco in Iowa.

When the stage of water in the Upper Iowa river is good the hydroelectric plant at Decorah will supply the system from its two dams. When water power becomes inadequate the Galena steam plant will send its power over the 200 miles of line to Iowa, supplying numerous towns and villages, farms, many creameries, cheese factories, pumping plants and factories along the way.

This extensive system is an excellent example of the economic advantages resulting from interconnection of steam and water-power systems and their expansion into large networks supplying a multitude of communities as well as almost innumerable farming and industrial customers adjoining the lines.

DIELECTRICS IN ELECTRIC FIELDS.

Three lectures delivered in London before the Institution of Electrical Engineers by G. L. Addenbrooke in February and March covered the following ground: The fundamental capacity action of electric storage in dielectrics is instantaneous and varies little with change of temperature or frequency. It is practically a constant, characteristic of each pure substance. When these constants for a number of elements and compounds are plotted on squared paper and are compared with the respective densities, and atomic weights a definite grouping becomes manifest, which seems further to show an additional relation depending on the position of the substance in the periodic table or on valency. These relations are evidently not relations between the constants themselves or (K) but between the constants, minus the pure ether storage of the space occupied by the dielectric, or (K—I). There is evidently a relation between (K—I) and the specific heats of many substances. There does not therefore appear to be much chance of obtaining insulating materials of lower capacity in the present state of our knowledge, except in a very limited degree by selection, but on the other hand, the losses and changes of capacity with change of frequency which occur in dielectrics in steady and alternating fields, appear to be due to the presence of small amounts of moisture or other electrolyte diffused throughout the dielectric and not to an intrinsic property of the material. Surface leakage losses in alternating fields show closely similar effects to those which occur in the body of dielectrics and afford further evidence that moisture is the root cause in both cases. The peculiar and significant temperature effects found are also due to the presence of moisture and offer a most promising field for experiment in further investigations of the fuller nature of dielectric actions. The electric energy dissipated in a good dielectric is expended in heat and this heating is due to the presence of small percentages of moisture. The antecedent causes of breakdown are, further, purely heat effects due to this presence of moisture, until we come to the last phase. The losses at moderate pressures, due to this presence of moisture, increase as the pressure is raised, and lead directly to breakdown. Their character at moderate presures may be made an index to the probable breakdown strength of insulating materials and their general behavior under working conditions. By proper preliminary research it appears probable that for any given insulator, data can be obtained by means of which the percentage of moisture in that particular material can be found by purely electrical measurements.

Contracting-Construction

Croft Begins New Series of Articles on Conduit Measurements—Financing Installment Plan for Wiring Old Houses

MAKING MEASUREMENTS FOR FITTING CONDUIT.

Laying Out, Cutting, Threading and Assembling Conduit Work in the Shop—Good Fit and Economy of Material Requires Accurate Measurement.

By Terrell Croft.

[*This is the first of three articles discussing methods of accurately measuring and laying out conduit work. These articles fit in with several series of articles on conduit construction by this well known writer that have appeared in* Electrical Review *within the last 15 months as follows: "Methods of Bending Conduit,"—7 articles in issues of Jan. 12 to Feb. 23, 1918; "Some Comments on Conduit Benders,"—4 articles in issues of April 27 to May 18, 1918; "Bending Racks and Roll Benders for Large Conduit and Pipe,"—5 articles in issues of June 22 to July 20, 1918; "A Few Facts About Conduit Fishing,"—7 articles in issues of Aug. 24 to Oct. 5, 1918; "Attaching Conductors to Fishing Wires and Pulling-in Lines,"—3 articles in issues of Jan. 11 to 25, 1919. In view of the steady increase in conduit construction, electrical contractors and wiremen will find these series of articles of considerable value.*]

A Working Sketch Is Often Desirable When Cutting Conduit for a complicated installation. Such a sketch, which should, if possible, be drawn to scale, can be made from the plans and drawings furnished for the work or from a verbal description of what is wanted, which is given by the individual who requires the work. Then after the conduit has been cut and bent to satisfy the dimensions of the sketch, the erector may be certain that it can be assembled readily on the job to form the complete installation.

Conduit May Be Cut and Threaded to Fit at the Shop before being taken to the job. This procedure will prove particularly convenient and economical where the work "repeats," that is, where, as often occurs in modern office and industrial buildings, an installation in one section is an exact duplicate of that in a number of others. Certain of the larger contractors are following this general practice and are making up parts or units of conduit installations and sending them assembled to the job. In making the measurements required for fitting conduit, there are a number of practices which may be utilized effectively, both to insure accuracy of fitting and to prevent waste of material. These methods will be described in following paragraphs.

The Distance Threaded Conduit Enters Screw Fittings varies somewhat with the make of fitting and with the actual diameter of the tube. The tube may not be exactly the nominal diameter specified in the manufacturers' tables. Fig. 1 and Table I indicate the probable fair average values. The values of Table I are based on the assumption that the length of thread on the conduit end corresponds with that shown in the tables of standard pipe threads. The end of the conduit should not be threaded for too great a distance, because if it is it will turn too far into the fitting. Thus, in connecting a tube into a fitting, it should be screwed into place securely. But it should not be forced, because if it is a strain may be induced in the casting which will immediately or ultimately cause it to crack.

For example, refer to Table I; the distance *S* (Fig. 1) which a 1-in. pipe will extend into a fitting will, on the average, be about 9/16 in.

Table I—Showing Average Length of Threaded Conduit Which Is Screwed into Fittings.

All dimensions are in inches. Dimensions given are averages. Some variations, due to imperfect tapping and threading, may be expected.

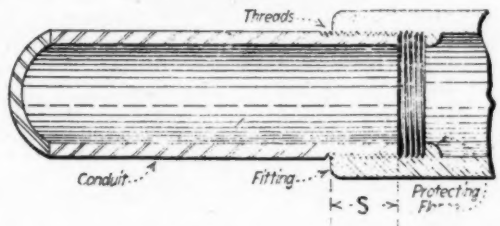


Fig. 1.—Length of Threaded Conduit Extending Into Fitting.

D Nominal Diameter of Conduit	S Length Screwed Into Fitting	D Nominal Diameter of Conduit	S Length Screwed Into Fitting
1/8	1/4	3-1/2	1-1/16
1/4	5/16	4	1-1/16
3/8	3/8	4-1/2	1-1/8
1/2	7/16	5	1-3/16
3/4	1/2	6	1-1/4
1	9/16	7	1-1/4
1-1/4	5/8	8	1-5/16
1-1/2	5/8	9	1-3/8
2	11/16	10	1-1/2
2-1/2	15/16	12	1-5/8
3	1		

In Taking the Measurement for a Length of Conduit to Connect Two Fittings (Figs. 2 and 3) the procedure is as follows: First obtain the distance *M* between the centers of the fittings which the conduit is to connect. Second, make allowance for the length occupied by the fittings and by the threaded end of the pipe which extends into them. Thus (in Figs. 2

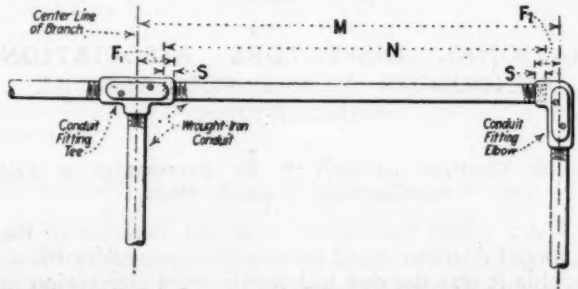


Fig. 2.—Finding the Length of Conduit Required Between Two Fittings.

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and 3) M represents the distance between centers of the fittings which are to be connected; N shows the actual length of the conduit or nipple required. To obtain the actual length N subtract from M the sum of the distances F_1 and F_2 from the center to the face of each fitting and add twice the distance S (Table I) which the conduit will enter the fitting.

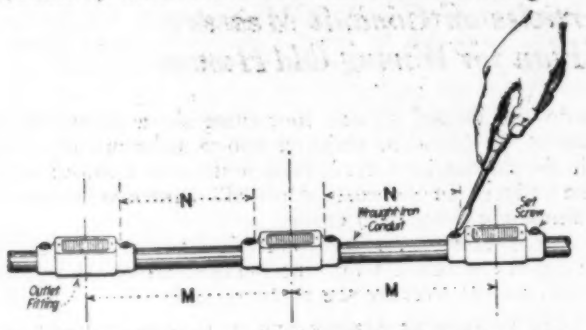


Fig. 3.—Showing How to Obtain Length of Nipple Where a Number of Similar Fittings Are Spaced Equidistantly Along a Run.

For example, if the distance M in Fig. 4 is 4 ft., the distance F_1 is 2½ in., and the distance F_2 is 1½ in., what will be the length N of a ½-in. conduit nipple to extend between these two fittings? The solution is found as follows: The sum of $F_1 + F_2 = 2\frac{1}{2} + 1\frac{1}{2} = 4$ in. Subtracting this from the distance

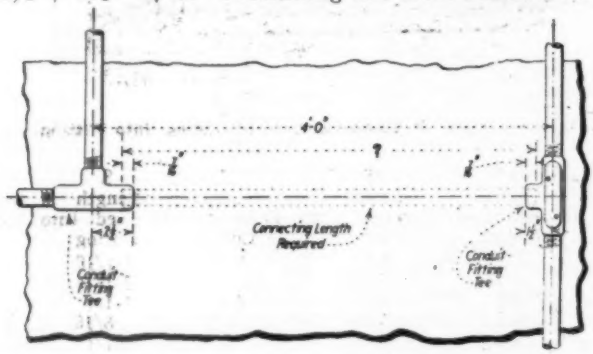


Fig. 4.—Example in Finding Length of a Connecting Conduit.

M, between centers, gives the distance between faces of the fittings, thus: 4 ft. or 48 in. — 4 in. = 44 in. Now add twice the distance S, which from Table I for ½-in. conduit is 7/16 in., thus: 7/16 + 7/16 = 14/16 or 7/8. Then, 44 in. + 7/8 in. = 44-7/8 in., which is the length N required.

(To be continued.)

NATIONAL INSPECTORS' ASSOCIATION ANNOUNCES PLANS FOR ANNUAL CONVENTION.

Entire Electrical Industry to Be Represented at Fall Meeting in Springfield, Mass.

At a recent conference of several members of the National Association of Electrical Inspectors in Philadelphia it was decided to hold the next convention in the Municipal building, Springfield, Mass., Oct. 13 and 14. This decision is the result of the enterprise of the Chamber of Commerce of Springfield which has earned the title of the "Convention City of New England" for that city.

Thomas H. Day, past president of the association, was appointed chairman of the committee of arrangements. The following have been appointed as the other members of this committee: Andrew A. Moffitt, 42 Weybossett street, Providence, R. I.; Charles M. Tait, 524 Choristine building, Montreal, Que.; R. M. Nesbitt, Bullitt building, Philadelphia, Pa.; William P. Briggs, Municipal building, New Bedford, Mass.; Allen W. Hopkins, 545 Dickenson street, Springfield, Mass.; James J. Hayes, 91 Butler street, Springfield, Mass.; Milton S. Nettleton, 98 Hobart street, New Haven, Conn.; W. S. Francis, City Hall, Pittsfield, Mass.; Margaret Dorcas Day, secretary, 59 Deerfield avenue, Hartford, Conn.

Mr. Day has announced as the slogan of the convention, "Meet Us in the Mahogany Room," which is derived from the name of the rooms in which the meetings will be held. The convention will be of interest to the entire electrical industry, contractors, wiremen, central stations, manufacturers, fire underwriters and municipal inspectors having equal opportunity in representation and in the discussions. Any of these interests, desiring to be placed on the mailing list in order that further information may be sent to them, should send their addresses to the secretary or to the member of the committee of arrangements in their territory. Suggestions for subjects of discussion may be submitted to Washington Devereux, 800 Bullitt building, Philadelphia, Pa., president of the Association, prior to June 1.

FINANCING TIME-PAYMENT PLANS FOR WIRING CONTRACTS.

Event of Proposed House-Wiring Campaign Lends Importance to This Subject.

This has been rightly termed an era of installment and rental plans. It has often been said that anything may be sold nowadays on either of these plans and events seem to bear out this statement. Real estate, homes, talking machines, furniture, sewing machines, many electrical appliances, etc., all have been sold and exploited along these lines and have received considerable stimulus therefrom. And this is not because the purchasers have not the ready cash with which to pay for these articles but is due chiefly to the fact that a sort of installment fad has developed among the majority of purchasers.

In many cases wiring contracts for existing buildings have been taken on the installment or time-payment plan, but these cases have been confined chiefly to places where the work was done by the central-station company or where the contractor has been supported by the central station in special campaigns. In comparatively few instances have the individual contractors or their associations undertaken the financing themselves. The proposed "National House-Wiring Campaign," which is to take place from April 1 to May 15 this year, and the prevailing condition in building activities makes this a particularly auspicious time for contractors and contractor organizations, where central-station support cannot be secured, to consider this question.

The principal objection which has been advanced to this plan for wiring contracts is that in case of failure to pay on the part of the customer the contractor has no recourse such as can be had by the removal of articles of furniture, etc. This objection, however, is exaggerated, for the proportion of such failures has been found to be very small, especially where a practice has been made of investigating credit

before accepting the contract. Proof of this lack of failures is evidenced by the fact that even with removable articles, companies could not afford to carry on the extensive business which many of them do, for the removal of such articles, once they have been used, means a considerable loss. On the contrary, the electrical contractor has a decided advantage in that he is dealing with a property owner, while these other firms often contract with parties having no financial responsibilities whatever.

Few contractors, however, are able or care to undertake the financing of such a campaign unassisted. In cases where the aid of the central station cannot be secured, the logical place to look for such help is from a bank or investment concern. A brief review of the methods of securing this help, therefore, may be of interest to many contractors.

The proposition may be handled by either the individual contractor or an association in one of two ways, both of which permit of variations. The first and more logical way is for the contractor to borrow the necessary funds from the bank, using the contracts as collateral. The second procedure is to sell the contract to the bank at a discount.

As was stated, the first way is the better and more businesslike method but necessitates a certain financial standing with the bank, which, unfortunately, many contractors do not have. In passing, it might be stated that this is due in the majority of cases to negligence on the part of the contractor rather than his financial condition. In this instance, the contractor borrows only enough to cover the cost of the job and receives his pay in specified installments from the customer. One advantage possessed by this plan is that it necessitates a certain number of calls at the contractor's place of business and if he operates a store in connection with his contracting business the possibilities of further sales of appliances, etc., to the customer are greatly increased.

The second plan of selling the contract direct to the bank offers special advantages to contractor organizations and to contractors who have not the necessary office force to carry out the first plan and whose business will not be improved by the additional calls of customers. Some difficulty may be encountered in getting banks to accept this plan although it is being carried on successfully by one organization at the present time—the Commercial Contractors' Association of Chicago. This plan permits of several variations and is much better suited for organizations than for individuals, for besides offering much better prospects to the bank if promoted by an association, it serves to increase the value of the association to its members.

In this method the contracts are assigned by the contractor to the bank and are purchased at a certain discount. Arrangements may be made whereby the bank assumes all responsibility for the contract and makes the collections or the contractor takes the responsibility and makes collections or a combination of both of these. As was stated, it is often desirable for the contractor to have the customer make calls at his store, and on the other hand, the repeated visits of the customers offer many advantages to the bank.

The contracts in this method usually carry with them lien rights to the property which adds a certain security to them. They may be made out either as interest bearing or on a straight discount basis. Of these the former is preferable, for while the interest charges may be confusing to the customer, both the customer and the contractor gain financially and as interest notes are negotiable, they are much more acceptable to the bank.

In any event, it behooves the contractor or local association to make some such financial arrangements as soon as possible and to stimulate their house-wiring business during the national campaign by the addition of a time-payment plan.

ADVERTISING SLOGAN PROMOTES BUILDING RESUMPTION.

To encourage the immediate resumption of building activities the Portland Cement Association has prepared a number of copper electrotypes similar to the one illustrated herewith. These electrotypes bear the slogan "Build Now" and are intended to be reproduced on the stationery etc. of contractors and others interested in promoting construction work.

Slogan Being Distributed by Portland Cement Association to Promote Building Activities.

They will be furnished free upon application to any of the district offices of the Portland Cement Association which are located in all the larger cities or to J. W. Collins, business representative of the Illinois State Association of Electrical Contractors and Dealers Association, 179 West Washington street, Chicago.

CONNECTICUT VALLEY CONTRACTORS TO ORGANIZE SECTION.

There will be an organization meeting of the Connecticut Valley district of the Massachusetts State Association of Electrical Contractors and Dealers in the building of United Electric Light & Power Co. at Springfield, Mass., March 26. The members of the Worcester district of the Association will attend the meeting in a body to assist in the organization of the new section.

At a recent meeting of the Boston district of this Association, J. P. Ryan, treasurer of the Building Trades Employers' Association of New York City explained in detail the working of this organization, what they have accomplished and how it has been accomplished since its origin in 1903. As many members of the Boston district already belong to the Boston branch of the association and many others are contemplating membership the meetings proved very interesting.

WISCONSIN STATE CONTRACTORS TO HOLD ANNUAL CONVENTION.

The Wisconsin State Association of Electrical Contractors and Dealers will hold its annual convention at the Hotel Pfister, Milwaukee, Wis., March 24 to 28. An interesting program has been arranged for this occasion which will include a number of prominent speakers. Requests for reservations should be addressed to J. A. Piepkorn, 108 Sycamore street, Milwaukee.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 457.—HIGH-SPEED GRINDER.—We wish to run an internal grinder at a circumferential speed of 5000 ft. per minute. As the wheel is only 2 in. in diameter, it would have to run about 10,000 r.p.m. What is the most practical way of getting this speed?—H. D., Detroit, Mich.

No. 458.—PENALTY FOR LOW POWER-FACTOR.—Where a power contract with a central station includes a penalty for low power-factor what means are commonly used to check up on what the average power-factor actually is? Do any power companies make an annual or semi-annual survey of their power customers, or at least the larger ones?—S. W. Q., Allentown, Pa.

No. 459.—LIGHTING FOR BEAMED DINING-ROOM CEILINGS.—In quite a number of apartments that we wired several years ago I find that the lights installed on the beamed ceilings of the dining rooms are seldom or never used. Usually these consisted of four rosettes at the intersections of the beams around a central rectangular panel, each outlet being equipped with a socket husk. Is the non-use of these lights due to decreasing popularity or fashion, or is there something about the installation that can be improved to make these lights more useful? Before ceasing to recommend wiring for such lights we should like to hear some opinions on this subject.—F. T. B., Milwaukee, Wis.

No. 460.—RAILS INSTEAD OF TROLLEY WIRES FOR TRAVELING CRANES.—I should like to know what experience is obtained from using light but fairly rigid contact rails in place of trolley wires for a traveling crane of large lifting capacity. Has this scheme been used to any extent? What method of supporting is used for the rails? Is it better to use sliding contact shoes or trolley wheels?—T. N. J., Akron, Ohio.

Answers.

No. 453.—SERIES STREET-LIGHTING SYSTEMS.—Recently I heard of a scheme for running series street lighting circuits without a constant-current regulator, but using a transformer of special type at each lamp post. What advantage, if any, does this latter system possess? Has it been tried out and, if so, with what results?—M. D. E., Denver, Colo.

[*Answer A* published in Feb. 22 issue of ELECTRICAL REVIEW.]

Answer B.—The system described is used for the new street-lighting circuits of Milwaukee, Wis. The central-station company's three-phase four-wire distribution network is tapped at various district centers through single-phase transformers with adjusting taps to vary the secondary voltage within certain limits for different numbers of lamps. The secondary circuit is a series circuit that runs past the lamp posts and feeds the lamps through special series or current transformers that are buried at the foot of the post. The lamp circuits thus constitute tertiary circuits of low voltage. One advantage is that no high voltage is carried into the post, thus insuring safety. The lighting circuits are entirely free of constant-current transformers or regulators and their numerous troubles. If a lamp burns out or is removed from the circuit, the current in the series circuit is not appreciably affected. No substation building or operators are required, as the lighting circuit is tapped off through outdoor equipment installed on poles in the alleys, an automatic time switch throwing the circuit on and off. This system has given no trouble since it was first introduced nearly three years ago. It is also used in some other cities in which the series transformers are sometimes placed in an enlargement of the lower part of the post so as to be accessible in case of trouble.—L. P. T., Milwaukee, Wis.

Answer C.—There are several different types of pole-type transformers now being used for purposes of current regulation on series lighting circuits. The installation of these devices has increased greatly in the last few years, due to the greater use of electricity for lighting in the suburban and country districts, and more especially in those districts in which a constant-current series lighting system has to be supplied from a constant-potential source. Practically all of the devices on the market contemplate the maintenance of a constant current in a circuit which is fed from constant-potential systems such as run through the suburban and country districts.

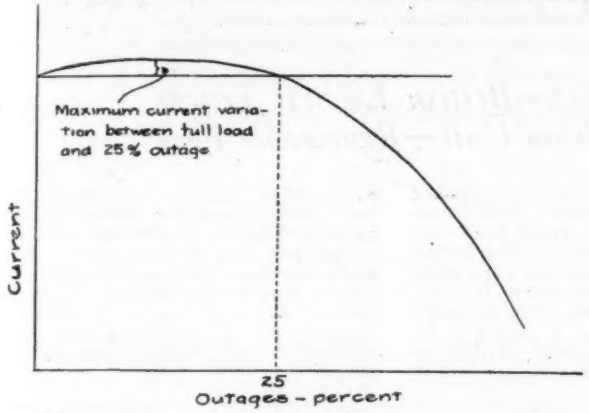
One such device makes use of an unsaturated high-reactance coil working in conjunction with saturated low-reactance coil, the apparatus being popularly known as the "phase displacement" type, since by the application of this principle the current is maintained substantially constant over the practical range of allowable outages. As shown in the accompanying curve, the current does not vary more than 2 or 3% between full load and 25% outage. Above the latter figure, however, the current curve droops considerably. It is assumed that whenever the outages reach the neighborhood of 25% immediate inspection will be made and new lamps installed.

Another form of apparatus differs radically from the above, in that by the use of a moving coil in a transformer mounted on the poles, the current is theoretically maintained constant, no matter what the outage of the circuit being supplied is. In such a device, one coil is stationary and mounted on the core of a small transformer, while a second coil mounted on the same core member is allowed to move with respect to the fixed coil, the force utilized being the mutual repulsion between the coils that is normally employed in a current transformer. The clearance of the movable coil is necessarily large, however, due to the requirement that it must move about a pivot and through an angle which is sometimes equal to 45° or more. This is, of course, productive of a large leakage of flux and one type of moving-coil transformer seeks to obviate this through the moving of the portion of the core which the moving coil surrounds, at the same time that the coil itself moves.

Still a third kind of pole-type regulator seeks to maintain constant current by suitably adding enough inductive drop to the system, so that although a decreased resistance is obtained due to the outage of a light, or a number of lights, the addition of the inductive drop to this latter quantity corrects the voltage to such an extent that the desired current regulation is obtained. This inductance is shunted around each individual lamp and, upon the outage of the lamp, the inductance across it is placed in circuit and when added vectorially to the resistance drop (relatively negative when the light is out) swings the voltage to the proper position and magnitude to maintain the current in the circuit constant.

The principal advantage by the use of these individual pole-type regulators over the old constant-current regulator of large capacity, which was placed in the central station and controlled a relatively long circuit, is that of flexibility. A satisfactory constant-current circuit may be obtained from any constant-

potential system of distribution and this is a great boon in the suburban and country districts. Moreover, where only a small percentage of the customers served by a power company desire constant current



Regulation Curve of Phase-Displacement Type of Transformer.

the cost of installation does not warrant equipping the central station with a large-capacity regulator for the entire system.—A. A. B., Pittsburgh, Pa.

No. 455.—Rates for Electric Service During Construction.—There are a large number of electrically driven construction devices which are only used temporarily during the course of construction or remodeling of buildings. Such apparatus includes hoists, floor polishers, small portable pumps, concrete mixers, etc. As they are only used for a short time, and usually by different contractors, considerable trouble has been experienced in establishing a definite equitable rate of charging for the service which they use. The installation of meters in such cases has been found unsatisfactory, as they are very liable to injury, and the total consumption of the apparatus is often less than the cost of installing the meter. Will some readers explain the methods by which a flat-rate charge may be drawn up and also the methods followed in charging for service connections where such are necessary?—H. J. W., Kokomo, Ind.

The present tendency in rate-making is to discard estimated bills and flat-rate systems in charges for energy consumption. This attitude is encouraged by various state utility commissions. Any charge not based on a meter reading is likely to bring up the question of discrimination. A portable main line switch and meter mounted in a box and provided with a lock will eliminate injury to meters and furnishes a convenient method of handling these jobs. The charge for current should be figured at the same rate as similar business of a permanent nature.—W. H. K., Evanston, Ill.

No. 456.—"Fieldless" Motor.—I was called on to look over a newly rebuilt 10-hp., shuntwound, 110-volt direct-current motor which had been recently installed and was not giving satisfactory service. While working on the machine, I found it was running with one side of the field coil winding open. Not having a voltmeter handy, I disconnected the other connection between that coil and the next, thinking possibly the field winding was grounded in one of the four field coils. I continued to disconnect the field coils, one from the other, each time trying the motor until I had all the four field coils disconnected and the machine showed no bad effects whatever, but continued to run an 8-hp. pump to which it was belted just as well as if the field coils were connected. This motor was bought for and is stamped 650 r.p.m., constant speed, but runs at nearly 1500 under load and makes over 2000 if belt comes off. Name plate is stamped "8 hp. open" "10 hp. closed." The machine is supposed to be a type CQ General Electric. Why will this motor develop nearly full horsepower with all field windings open? Why does it run at excessive speed? Why does it run away when belt comes off? What does "open" and "closed" refer to?—F. G. H., Hairston, Ala.

Answer A.—If this motor is really stamped: 8 hp. open, 10 hp. closed, there must be given on the name plate of the motor the time for which the 10 hp. can be developed, as it is utterly impossible that a machine which gives 8 hp. continuously as an open motor, could give when enclosed 10 hp. also continuously without dangerous overheating. The reverse (10 hp. open, 8 hp. enclosed) would be more likely. Closed simply means that the openings in the brackets of the motor are closed to protect it against injury.

This motor has a very high remanence in the iron part so that even with all the excitation from the field coils removed enough magnetism is retained to create a field strong enough to give a fair performance. Of course, the field is weaker than when the field windings are connected, and this accounts for the extremely high speed under no load, i.e., over 2000 r.p.m. But as the normal speed of the motor is 650, which is rather low for a motor of 8 hp., the resistance of the armature is intrinsically high, so that under load the voltage drop in the armature is considerable, which makes the speed drop from 2000 to 1500. It is doubtful, however, if the motor develops really only 8 hp. at 1500 r.p.m., because a pump requires an energy almost in proportion to its speed, so that either at 1500 the energy taken by the motor from the line is more than double the normal output, or at 650 r.p.m. the pump does not require 8 hp., which is more likely because otherwise at 1500 r.p.m. with the weak field the sparking at the brushes would be very bad, which is not mentioned in the question, however. The proper connection of the field winding will very likely put matters right.—H. A., Pittsburgh, Pa.

Answer B.—As it is impossible for a motor to run without excitation it is probable that the machine in question is not a shunt wound machine at all but is compounded. As the excessive speed, especially at "no load," is a series characteristic there may be an open in the shunt winding, or part of this winding may be incorrectly connected and be neutralizing the other part in which case the machine will run as a straight "series" motor. As the motor has just been rebuilt it may be that such a mistake has been made. The fact that the motor being marked "constant speed" would point to its being compound wound. The motor is possibly of special design to run as either compound or series and is now running with the shunt open and is operating an 8-hp. pump, which is its full load for this connection. Compounded, it would give the second rating of 10 hp.—J. S., Cumberland, B. C., Canada.

Answer C.—If the brushes of a motor are given a lead, it is possible for the motor to run without any field excitation other than that furnished by the armature, but because of the brushes being set leading in place of lagging there will be excessive sparking. The speed of a motor is determined by the strength of its field magnetism, the speed being higher for a weak field than for a strong one. This would account for the higher speed when there is no load on the motor, since the small armature current produces a weak field. The open and closed rating on the name plate is probably accounted for by the fact that some types of motors are used with dust shields on the ends. As the ventilation is poor under these conditions the motor must be given a lower rating than when operated open without the shields. It would be interesting to know whether it was found that the direction of rotation of the motor was reversed after the field was reconnected or whether the brushes had been set in the wrong position.—H. S. R., Wahpeton, N. Dak.

New Appliances

Unique Pipe-Threading Tool Set—British Electric Trucks —Triple Light Distribution from Unit—Renewable Fuse

New Beaver Pipe-Threading Tool With Separate Die Units.

The Borden Co., Warren, Ohio, manufacturer of the well known Beaver easy working die stocks and square-end pipe cutters, has brought out a new pipe-threading device known as the No. 3 Beaver Junior.

This little tool is built on the unit plan to thread ⅛, ¼, ⅜, ½, ¾ and 1-in. pipe. It can be purchased complete or the units can be bought separately.

The new tool consists of a ratchet handle and separate die heads to thread

No. 3 Beaver Junior Pipe-Threader With Separate Die-Head Units.

each size of pipe. The whole outfit is attractively finished and packed in a convenient wooden case. It makes an ideal tool for use about the home as well as a very practical tool for the workshop.

In keeping with the high quality of other Beaver tools, the new tool possesses certain unique and valuable mechanical features. For instance, the ratchet mechanism is entirely encased so that it is impossible for dirt or grease to accumulate and retard the action of the tool; this is an important advantage. The addition of the 1-in. size to the range is another advantage which will be greatly appreciated by the trade.

New British Industrial Truck.

It is expected that industrial electric tractors and trucks will be much more generally used in British warehouses and factories in the future as a measure making for increased efficiency and to facilitate the handling of materials. In anticipation of this demand the British Electric Vehicles, Ltd., of Southport, England, has introduced a new one-ton truck for such service.

The specifications given for this truck are similar in many respects to our standard American designs. It has a loading space 6 ft. by 3 ft. 1 in., the platform being 1 ft. 8½ in. from the ground. The speed on the level is 6 to 7 miles per hour, and the rated mileage per battery charge is 20 to 25 miles on the level. The battery consists of fourteen 25-volt cells of the chloride "Ironclad" pattern, with a capacity of 193 amp. The charging rate is 25 to 40 volts, 10 amp., and boosting charges can be given up to 50 amp. when necessary. The vehicle is fitted with three speeds in either direction, and a bell push is attached to the controller handle. The transmission is by chains from both motors to the rear wheels. The brake, which is of the external expanding pattern to both rear wheels, is operated by a foot pedal, and is normally in the "on" position. A switch is interlocked with the brake, cutting off the current when the brake is on, and vice versa.

Livingston "Economy" Light for Interior Lighting.

An interior lighting unit with several unique features has been placed on the market by J. Livingston & Co., Inc., Grand Central Terminal, New York City. It is known by the trade name "Livingston Economy Light," it being contended by its makers that its use is economical both of money and of eyesight. The upper reflector is made of porcelain-enameled steel, the lower bowl is of an opal glass known as Celestialite. This diffuses the light that passes downward through it, while also reflecting part of the light to the outer surface of the large reflector. The major portion of the light is reflected upward by the large reflector

Unique Lighting Unit Which Has Three Kinds of Light Distribution.

toward the ceiling. Thus the unit gives three kinds of light distribution, two of which are indirect and one direct.

This unit, on which patents are pending, is the invention of P. W. Mathieu, manager of the Livingston organization. It has a pleasing outline and is easily cleaned, and is furnished, either plain or decorated, for Mazda C lamps ranging from 75 to 500-watt sizes. Its design has been worked out to practically eliminate glare and at the same time to give a high efficiency of illumination. It can be used in a variety of interiors, the size and decoration being selected to suit the individual requirements.

Pierce Ferrule and Knife-Blade Renewable Fuses.

In these days of big quantity production attended by heavy investments in machinery and equipment, it is vitally necessary to keep power lines in con-

Pierce Knife-Blade Renewable Fuse Opened to Show Internal Construction.

stant service. The "power off" periods must be cut to a minimum. Overloads will occur and fuses will blow. It is therefore necessary to protect production as well as those in charge of the electrical equipment by using fuses that can be quickly and properly renewed or refilled, and which are absolutely safe and foolproof.

The new Pierce renewable fuse is designed to fulfill these needs. It can be furnished both in ferrule and knife-blade types. One end of the fuse link is slotted at the end, and the other is slotted at the side, thus making it convenient for inserting in position, it only being necessary to loosen the two screws, which when tightened hold the fuse in place. To refill the ferrule type fuse unscrew the cap, pull it apart, loosen the screws, insert the new fuse link, tighten the screws, and screw on the cap. To refill the knife-blade type, simply pull it open, loosen screws, remove the remaining portions of the old link, insert the new fuse link, tighten the screws and close.

The fuse cannot be inserted in the clips unless it is fully closed, thereby making it a safe one to handle. It is claimed that the Pierce fuse can be removed from the circuit, renewed and returned in 15 seconds. A screw driver is the only tool required. There are no loose pieces to contend with. A unique venting arrangement is provided to take care of the gases that accumulate when a fuse is blown, thus minimizing the charring of the fiber or the fusing tight of conpections on heavy "shorts." The knife blades are always rigid and in perfect alinement, insuring positive contact.

The Pierce fuses are made for 250 and 600 volts, ranging from 3 to 600 amperes in capacity. They are manufactured by the Pierce Fuse Corporation, Buffalo, N. Y.

Trade Activities

Interstate Electric to Extend Facilities—Washing Machine Exhibition a Success—Dayton Fan & Motor Reorganized

The Borden Co., Warren, Ohio, manufacturer of Beaver pipe-cutting and threading tools, has been honored by election as a member in the Rice Leaders of World Association, which is by invitation only to companies handling the highest quality products.

Electrical Engineers Equipment Co., designer and builder of power plant appliances, Chicago, has just issued several pages of its Bulletin 108, numbering from 24 to 36 inclusive. These illustrate and describe outdoor switching equipment and show diagrams of various combinations of "Three E" equipment.

The Dayton-Dick Co., Quincy, Ill., has changed its name to the Dayton-Dowd Co., this action being taken because of changes in the organization. The capital has been doubled and the business placed directly under the control of those immediately interested. Plans are being prepared for broadening its field of activity and facilities are being greatly extended. The company has recently received many orders for large irrigation and drainage pumps, and it can now build any size from 1¼ to 30 in. in a split casing type of pump. It has developed a complete line of fire pumps, complying with specifications of the various underwriters' boards. Furthermore, it has developed high pressure and hydraulic pumps for boiler feed, elevator pumps and similar high pressure service, and these lines are to be pushed to the utmost.

Interstate Electric Co., New Orleans, La., because of the enormous export business which it is now doing with Central and South America, as well as Cuba, has found it necessary to increase its facilities and will renovate a building at the corner of Baronne and Perdid streets, in that city. The entire ground floor of the building will be rebuilt so that an up-to-date retail department for electrical and automobile fixtures may be installed. Another floor will be added to the five-story building. This floor will be devoted to the offices of the concern, and a half floor built above it will be equipped as a recreation room for employes. Percival Stern, president of the company, has also announced that an instructor has been employed to teach the employes stenography, accounting, letter writing, advertising, salesmanship and other useful subjects, all the instruction to be given on the company's time, gratis to the employe. The company has at present nine representatives in Cuba, South and Central America and will shortly increase this number to sixteen and establish three branch offices to care for the demands of its foreign trade.

The Western Dry Battery Co., maker of Bull Dog dry cells at Seattle, Wash., has moved into its own two-story factory building at 15th avenue and Wheeler street. These works were established six years ago. James Bennett and Roy Bennett are president and manager, respectively.

General Electric Co. in its Fort Wayne (Ind.) plant has adopted a new scheme of service flag for the men who are coming back to the works. Whenever a soldier, a former employe, returns to work a star is added to the flag. At the present time the flag contains nearly 160 stars and additional ones are being added every day.

Roller-Smith Co., 233 Broadway, New York City, announces the appointment of P. I. Perkins Co., 141 Milk St., Boston, Mass., as its agent in Massachusetts, Connecticut and Rhode Island. The Perkins company will handle in this territory the Roller-Smith Co.'s line of instruments, circuit breakers and meters, and has arranged to have its W. A. Blachford give his special attention to its Roller-Smith activities.

Domestic Engineering Co., Sioux City, Iowa, was recently organized by local business men to distribute domestic specialties in the states of Iowa, South Dakota and Nebraska and will operate a branch in Des Moines. Among the products distributed by this company are Isko refrigerating machines, Marco electric light and power plants, Stolco electrical fixtures, Tuec vacuum cleaners, Almetal laundry machines and Sharp ash disposal systems. In addition, a complete line of electrical supplies and accessories will be handled. C. A. Kuenzel, Jr., is president of the company.

Electric Vacuum Cleaner Co., Inc., was recently incorporated with principal offices in Cleveland, Ohio, and New York, as previously announced. The new concern is a consolidation of the business and manufacturing facilities of the Frantz-Premier Co., Cleveland, and the vacuum cleaner business of the Edison Electric Appliance Co., Chicago. It will be devoted to the manufacture and sale of electric vacuum cleaners, including stationary and portable types, and will equip its output with General Electric motors. The present local service stations maintained by the Frantz-Premier Co. will be extended and developed to give complete service to users of products of the new concern. The directors of the new company are: Julius Tuteur, Maynard H. Murch, John Sherwin, A. V. Cannon and E. W. Miner, of Cleveland; F. S. Hunting, Ft. Wayne; G. A. Hughes, Chicago; C. E. Patterson and A. K. Baylor, New York.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has sold to British interests for approximately $7,000,000 its holding in Electric Holdings, Ltd. The latter concern was organized in London in May, 1917, to take over the British Westinghouse Electric & Manufacturing Co.

Air Reduction Sales Co., 120 Broadway, New York, is sending out new folders dealing with Airco products, including welding and cutting apparratus, calcium carbide, oxygen, nitrogen, acetylene generators, acetylene and welding rods. They are well illustrated and show the benefits derived from the use of these products and methods employed in building up worn frogs and repairing damaged locomotive cylinders.

Star Electric Co., Gary, Ind., has been purchased from J. A. Defresne by a group of electrical engineers composed of Thorton A. Wood, John E. How and Joseph Thompson. The first two mentioned will be active in the conduct of the business but Mr. Thompson will continue to hold his position in the electrical department of the American Bridge Co. Mr. Wood will have charge of the steel work of the new company. Mr. How was until recently connected with the General Electric Co. at Ft. Wayne, Ind. The new firm will act as consulting electrical engineers as well as carrying on the regular electrical contracting and merchandising business of the Star Electric Co.

Dayton Fan & Motor Co., Dayton, Ohio, manufacturer of electric desk, oscillating, ceiling fans, small power motors, belt-driven fans and water motors, recently underwent a complete change in organization. The following are the new officers of the company: Edwin O. Waymire, president; Lee W. James, vice-president; Clyde C. Miner, secretary and treasurer. Mr. Waymire has been connected with the company in an official capacity since its inception about twenty-eight years ago. He is thoroughly acquainted with the trade and its requirements. Mr. James is one of the most prominent attorneys and financial men of Dayton, and Mr. Miner has been associated with the Robbins & Myers Co. for the past 20 years as general auditor and credit manager. The experience of these three men insures the electrical trade an organization which will undoubtedly prove of great advantage to the Dayton Fan & Motor Co. The company purposes to immediately build new factories, with a floor space of approximately 100,000 sq. ft., to accommodate its expanding business. Plans have already been laid to engage in the production of small motors, both alternating

current and direct current, for the resale manufacture of household electrical appliances. A competent organization is being perfected, adequate buildings will be erected, and it is expected that within six months the company will be in a position to produce these motors in large quantities.

Delta-Star Electric Co., 2433-2453 Fulton street, Chicago, is distributing Bulletin No. 34, perforated to fit Delta-Star Binder B-140, which describes and lists outdoor busbar and wiring supports with unit insulators of the same type used with equipment in Bulletin No. 32. Another circular issued by the company (Bulletin No. 302) illustrates and describes three-phase low tension equipment up to 600 volts. A third publication is Addenda Bulletin No. 31A, dealing with "Unit Type" indoor bus supports and should be filed with Bulletin No. 31.

Redmon, Edgar & Redmon, Cedar Rapids, Iowa, manufacturers of E-Z-Way kitchen equipment, are distributing a catalog 9½ by 4¼ in. in size, illustrating and describing in detail their line of electric kitchen equipment, which includes electric and hand power dish washers, vegetable parers, receiving tables, dish carriages, hollow-ware washers, steel cupboards, etc. Since its introduction about five years ago, the E-Z-Way dish washing machine has met with much success, and in its use in a wide field of various institutions throughout the country no conditions have been met that have suggested a necessity for any marked improvement, and the machine is presented without a change in principle. In spite of the fact that the concern has witnessed considerable inconvenience in obtaining material, it has been able to fill orders promptly and maintain the excellent quality of its equipment, and with the return of normal conditions proposes to add to its line several useful inventions which have suggested themselves through a careful study of requirements in this field. The latest addition to the company's line is the electric E-Z-Way hollow-ware washer and silverware burnisher, which is an original and valuable invention and a popular addition to the extensive line of E-Z-Way equipment produced by the company.

American Steel & Wire Co., with branches in the principal cities of the country, has issued a number of pieces of literature dealing with its various products. One of these is entitled "Rail Bonds and Bonding Appliances," which describes in a brief and comprehensive manner bond tester and instruments, bonding tools and appliances; bonds for rail webs, rail heads and rail base; compressors; concealed rail bonds; drilling machines; exposed rail bonds; flame welding outfit; hand tools, socket terminals; tools for soldering, and various types of rail bonds. Numerous illustrations and diagrams accompany the text. Another booklet discusses the use of American ignition wires and cables for automobiles, motor boats and airplanes. It enumerates the dominant features which distinguish this company's ignition wires and cables and includes diagrams showing electrical connections, mechanical and electrical connections of a typical single-wire, three-unit system, etc., of automobiles. An article on "Monoplane, Biplane and Triplane Wing Trussing" by F. W. Pawlowski, and another on "Examples and Forces of Biplane Side-Bracing," an extract of a paper presented by the same author at the First Aeronautic Session of the Society of Automotive Engineers, are also contained therein. A third bulletin deals with wire rope and its various uses, the principal ones being: haulage rope for mines, docks, etc.; hoisting rope for elevators of all kinds, mines, coal hoists, dredges, conveyors, etc.; special flexible and extra flexible rope for cranes, counterweights, ammunition hoists, dredges and kindred uses.

Roller-Smith Co., 233 Broadway, New York City, has issued Bulletins 410 and 520, the first dealing with its line of four-in. "Imps," and the second with its industrial type of circuit breakers. The instruments known as "Imps" are voltmeters and ammeters of compact size for use in battery charging and other small switchboards and panels. They are of high-grade construction and made in a variety of ranges. The industrial circuit breakers are a modification of the company's well known "Standard type, but have some of the refinements of finish omitted, these being unnecessary for the average industrial plant. They are made in sizes up to 100 amperes and in single, double, triple and quadruple pole types.

Sanford-Riley Stoker Co., Worcester, Mass., is mailing a leaflet on its stoker. With the word reconstruction the byword, and used so often and so misapplied as to really be a misnomer, it is pleasant to encounter and literature dealing with after-the-war problems in which the word reconstruction is omitted. "Coal Runs the Machinery of Peace" is the title of a leaflet being circulated by the company to discuss features of its underfeed stoker. This leaflet, artistically gotten up in red, white and blue, illustrates and describes various salient features of the Riley stoker, and includes a curve of performance and an illustration of the famous installation of these stokers under the 3373-hp. boilers at the Essicks station of the Public Service Co. of New Jersey. It is accompanied by a supplement on "stoker service," in which the names and addresses of the company's district managers are given for the benefit of those needing advice and help.

W. A. Blonck & Co., 155 N. Clark street, Chicago, manufacturer of boiler efficiency meters, have gotten up a very interesting chart, explaining draft and what it implies, with special reference to the new style Blonck efficiency meter. The theme of this chart is the perfect firing point, where waste stops and economy starts for various conditions. The position of the draft under and over the fire, the effect of air in filtration, holes in the fire, thick fuel beds, passages clogged with slag and soot, excessive draft under the fire and closed stack damper are all shown diagrammatically in a simple, clear and concise way. This chart constitutes a most illuminating description of what measurements of draft show. The draft gauge is a means to the end, and inability to interpret the readings of a draft gauge make the investment in draft gauges of little use. While these Blonck charts refer specifically to the Blonck efficiency meter, the descriptive matter, the inferences, interpretations and conclusions make this chart of value to every fireman and others interested in the operation of boilers.

Home Specialty Co., Cleveland, Ohio, manufacturer of the Laun-Dry-Ette, is erecting a two-story fireproof brick building, which will be ready for occupancy some time in May. It is hoped that the present scarcity of Laun-Dry-Ettes will be somewhat relieved by the enlarged output which the new structure will afford. The output of Laun-Dry-Ettes in the present quarters has been more than doubled since the signing of the armistice. The Laun-Dry-Ette is an electrically-operated machine which eliminates the wringer by the use of a centrifugal dryer.

Westinghouse Electric & Manufacturing Co., of East Pittsburgh, Pa., has issued a complete catalog in which all of its electrical supplies are listed. In compiling the catalog every effort was exercised to make it of the greatest convenience to purchasers. The catalog is made up of 1264 pages of description pertaining to the products of the company and a score of other pages contain a complete cross index, and index to style numbers, and a table of "Approximate Cost Multipliers," which enables one to figure the approximate cost of all supplies listed. Although the book is called a catalog, it contains a vast amount of information of a technical and engineering nature. Practical suggestions for the use of many kinds of apparatus for the transmission and utilization of electric power are given. It is planned to issue this catalog annually. The publication of this catalog is quite noteworthy, as it is the first book of such a nature published by an electrical concern having the wide diversity of products sold by the Westinghouse company.

American Washing Machine Manufacturers' Association, 10 South La-Salle street, Chicago, is in receipt of a letter from Professor Scoates, of the Mississippi Agricultural and Mechanical College, in which the results of the demonstrations of washing machines made recently at the State conference of home demonstration and home economic agents are set forth. At this conference Raymond Marsh, secretary of the Association, presented a paper entitled "How the War Developed an Increased Use of Household Labor-Saving Devices," which was abstracted in a recent issue of the ELECTRICAL REVIEW. This paper created a great deal of interest and was followed by a demonstration of twelve different washing machines that were kindly loaned by members of the Association. This demonstration was very successful and convinced those in attendance, among whom were many women agents, that there is a splendid field for washing machines in practically every county of the state, despite the fact that this state has available a large number of negro domestic servants.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Grand Isle, Me.—The Allendale Mill has had plans prepared for the construction of a boiler plant in connection with the erection of a proposed sawmill. A. S. Hammon is manager.

Vinalhaven, Me.—H. W. Fifield, Vinalhaven, has recently completed the purchase of the electric plant of the Islands Electric Co. at Vinalhaven for a consideration said to be about $25,000. The plant was constructed about three years ago at a cost of $80,000, and was disposed of at public auction.

Springfield, Vt.—Colonial Power & Light Co. has been awarded a contract by the Gay Brothers Woolen Co. for supplying additional electric energy for the operation of its plant in the amount of 100 kv-a.

Gardner, Mass.—An appropriation of $14,300 has been approved by the city council as requisitioned in its annual budget for 1919, to be used for street lighting purposes.

New Bedford, Mass.—Fairhaven Mills Corporation has recently commenced work on alterations and improvements at the boiler plant at its works in Coggeshall street, estimated to cost about $10,000.

Southbridge, Mass.—In connection with its annual budget for 1919, the city has made an appropriation of $14,000, to be used for the operation of the street-lighting system during this period.

Spencer Mass.—The Town Council has approved an appropriation of $5,000 to be used for street lighting purposes during 1919.

Worcester, Mass.—In arranging the annual budget for 1919, the City Council has recommended appropriations of $194,000 and $8,000 to provide for the operation of the street lighting department and fire alarm system, respectively.

Westerly, R. I.—The city is considering the issuance of additional bonds for $200,000, to provide for the installation of the proposed municipal lighting plant. A bond issue for $100,000 was recently approved by the State Legislature for this purpose.

Albany, N. Y.—In connection with plans arranged by the State Superintendent of Public Works, Lewis Nixon, for extensive work at the terminus of the State Barge Canal at New York City, estimated to cost approximately $400,000, new battery charging motor generator sets will be installed at various New York terminals.

Albany, N. Y.—The state board of trustees has awarded a contract to Finch & Hahn, 86 Central avenue, Albany, for electrical work in connection with new construction at the State Agricultural Hall, State and Eagle streets.

Brooklyn, N. Y.—The Brooklyn State Hospital has filed application with the Finance Committee of the State Legislature for appropriations as follows to provide for various improvements: $5,000 for the installation of additional power plant equipment; the installation of a new local telephone system and the lighting of the institution grounds, $1,500 and $1,000, respectively; the installation of a new fire alarm system, $5,000; and $65,000 for the installation of new electrical and mechanical equipment in the laundry. Isham G. Harris is superintendent.

Buffalo, N. Y.—Suburban Electric Development Co. Inc., a Pennsylvania corporation, has filed notice of authorization to operate in New York state. W. S. Water, Buffalo, has been appointed local representative.

Buffalo, N. Y.—The Board of Managers of the Buffalo State Hospital, George W. Gorrill, superintendent, is arranging plans for the installation of new mechanical stoker equipment, boilers, etc., and improvements in the blowoff pipes to the boilers at the institution. It is understood that application for appropriations to cover the cost of the work will be made to the Finance Committe of the State Legislature.

Central Islip, N. Y.—The board of managers of the Central Islip State Hospital, Dr. G. A. Smith, superintendent, has made application to the Finance Committee of the State Legislature for an appropriation of $15,000 to provide for the installation of a new fire alarm signal system at the institution; $30,000 for the purchase of new electrical and mechanical equipment to be used in the laundry building; and $2000 for improvements in the boiler equipment at the north colony.

Gowanda, N. Y.—The Gowanda State Homeopathic Hospital, Clarence A. Potter, medical superintendent, has arranged plans for the installation of motor-driven pumping apparatus and electrical equipment for the Indian reservation, estimated to cost $8500; and improvements and alterations in the power house and boiler equipment at the institution. It is understood that application will be made to the finance committee of the State Legislature for appropriations to cover the cost of the proposed work.

Lyons, N. Y.—In connection with appropriation plans for the Borough during the coming year, arrangements are being made for a substantial fund for street-lighting work. During the past year an appropriation of $5000 was employed, and it is expected to increase this amount as may be required for 1919.

New York, N. Y.—Multiple Storage Battery Co., 427 West 50th street, has completed negotiations for the leasing of a new plant to be erected by the H. & B. Development Co., New York, at Jamaica, L. I. The plant will be one story, about 60x 120 ft., and will be located near the Long Island Railroad freight station. It is estimated to cost about $18,000.

Macedon, N. Y.—The Town Board will submit the question of issuing $6500 electric improvement bonds to a vote of the people. Address B. L. Beal, town clerk.

New York, N. Y.—Notice has been filed with the Secretary of State by the Gaston, Williams & Wigmore Electrical Engineering Corporation, 39 Broadway, of an increase in its capitalization from $500,000 to $1,-000,000, to provide for expansion.

Ogdensburg, N. Y.—St. Lawrence Transmission Co. has filed notice with the Secretary of State of an increase in its capital from $525,000 to $3,000,000, to provide for general expansion.

Phelps, N. Y.—The Board of Village Trustees has approved the appropriation of $2688, to provide for the operation of the street lighting system for 1919.

Poughkeepsie, N. Y.—The Hudson River State Hospital, Walter G. Ryan, medical superintendent, is considering plans for various extensive improvements at the institution, including the installation of new electrical equipment. It is understood that application will be made to the State Legislature for appropriations to provide for the proposed work.

Sea Cliff, L. I., N. Y.—The Village Board of Trustees has approved an appropriation of $6060 to be used for street-lighting purposes for 1919.

Schenectady, N. Y.—General Electric Edison Corporation of China has changed its corporate name to the China General Edison Co., Inc. Notice has been filed with the Secretary of State.

Utica, N. Y.—The board of managers of the Utica State Hospital has awarded a contract for the proposed installation of new boiler equipment at the institution. The work will cost $38,130.

Newark, N. J.—Essex Storage Battery & Supply Co., with main plant at 272 Halsey street, is now fully established in its new service station at 279-81 Halsey street. The new establishment comprises about 18,000 sq. ft. of floor space, and is equipped

with every appliance required in a modern plant of this nature. Geofray Simon and Harry Lippe are heads of the company.

Newark, N. J.—Hecke & Macke, 60 William street, manufacturers of batteries, etc., have acquired the building at 63 Mt. Pleasant avenue and are planning for the establishment of a new service station in the structure.

Newark, N. J.—American Oil & Supply Co., Lafayette street, has completed plans for the construction of a new power plant and administration building in connection, with the erection of its proposed plant at 238 Wilson avenue. Percy B. Taylor, 31 Clinton street, is consulting engineer.

Passaic, N. J.—Notice has been filed by the Okonite Co., Canal st., manufacturer of insulated wires, of an increase in its capital from $600,000 to $1,500,000.

Perth Amboy, N. J.—The Board of Aldermen is planning for the installation of a total of 1400 new 20 ampere, 600 cp., 14.1 volt incandescent lamps; and 500 lighting units of smaller capacity. William C. Wilson is chairman of the Committee on Lamps and Lights.

Trenton, N. J.—Plans are under consideration by the City Council for the establishment of a new municipal electric plant.

Trenton, N. J.—Plans are being arranged by the Equitable Pottery Co. for the rebuilding of its plant recently destroyed by fire. A large quantity of electrically operated equipment, including motors and auxiliary apparatus was destroyed.

Beatty, Pa.—The Board of Trustees of St. Vincent's College is having plans prepared for the construction of a one-story power plant at the institution, estimated to cost, with equipment, in excess of $100,000. The Joseph A. Langdon & Sons Co., 608 Grant street, Pittsburgh, is the consulting engineer.

Floreffe, Pa.—In connection with the completion of the marine ways on the Monongahela river by the Vesta Coal Co., recently constructed considerable new electrical equipment for operation has been installed, the entire work representing an expenditure of approximately $700,000.

Hershey, Pa.—Hershey Chocolate Co. has completed plans for the construction of the proposed factory and power plant addition to its works.

Kingston, Pa.—Luzerne County Gas & Electric Co. has filed notice with the Public Service Commission of a bond issue for $484,000, to be used in part, to provide for extensions and improvements.

Philadelphia, Pa.—The Navy Department has awarded a contract to Wark & Co., Philadelphia, for the construction of the proposed one-story brick substation at the League Island Navy Yards. The structure is estimated to cost $7695.

Pittsburgh, Pa.—Westinghouse Electric & Manufacturing Co. has completed the sale of its holdings in Electric Holdings, Ltd., London, England, to British interests for a consideration understood to be approximately $7,000,000.

Pittsburgh, Pa.—Crescent Electric & Manufacturing Co., 2515 Penn avenue, is making extensive preparations at its plant to resume operations on a peace-time basis. It is understood that a quantity of new equipment will be required by the company.

Baltimore, Md.—Consolidated Gas, Electric Light & Power Co. has disposed of the issue of $5,000,000 7% convertible gold notes recently offered for sale.

Myersville, Md.—Hagerstown & Frederick Railway Co. is having plans prepared for the construction of the proposed local substation, one-story, about 40x60 ft., estimated to cost $10,000. Paul Smith is superintendent.

Hampton Roads, Va.—The Navy Department is arranging plans for the construction of a one-story local boiler plant, about 56x103 ft., estimated to cost in excess of $200,000.

Asheville, N. C.—Asheville Power & Light Co. is considering plans for the installation of additional machinery at its plant, to increase the present capacity.

Albany, Ga.—In connection with the proposed construction of a hydroelectric plant on the Flint river, near Albany, by the Georgia-Alabama Power Co., it is understood that a total of 10,000 hp. will be developed, the project being estimated to cost approximately $2,000,000. W. J. Vested, Jr., is general manager.

Atlanta, Ga.—The city has approved a bond issue for $300,000 to provide for the construction of a new municipal electric generating plant.

Alma, Ga.—At the meeting of the City Council a resolution was passed calling for a $15,000 bond election. The money is to be used to put in an electric light plant in Alma. Address mayor.

Winter Haven, Fla.—Winter Haven Wagon Works will improve wagon works. The specifications include forge and electric welding outfit. Address Henry A. Marks, owner.

DATES AHEAD.

Wisconsin State Association of Electrical Contractors and Dealers. Annual convention, Hotel Pfister, Milwaukee, Wis., March 24-28. State secretary, John A. Piepkorn, 108 Sycamore street, Milwaukee, Wis.

Wisconsin Electrical Association. Annual meeting, Milwaukee, March 25-27. Secretary, J. P. Pulliam, 1408 First National Bank building, Milwaukee.

Tri-State Water and Light Association. Annual meeting, Greenwood, S. C., April. Secretary-treasurer, W. F. Steigitz, Columbus, S. C.

Pacific Division, N. E. L. A., Pacific Division, National Electrical Jobbers' Association and California Association of Electrical Contractors and Dealers. Joint convention, Del Coronado, Cal., April 30 to May 2.

National Fire Protection Association. Annual meeting, Ottawa, Ont., May 6-8. Secretary-treasurer, Franklin H. Wentworth, 87 Milk street, Boston, Mass.

National Electric Light Association. Annual convention, Atlantic City, N. J., May 19-23. Secretary, T. C. Martin, 33 West 39th street, New York City.

Illinois Association of Electrical Contractors and Dealers. Summer convention, Decatur, Ill., June. Secretary, N. M. Blumenthal, 179 West Washington street, Chicago.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

NORTH CENTRAL STATES.

Akron, Ohio.—Architects Griggs & Meyer, 110 W. 40th street, New York City, have prepared plans and will let contract for erecting a $50,000 power plant here for the B. F. Clengerman Co. The building will be 40x80 ft. in dimensions, one and one-half stories in height, brick, steel and concrete material, steam heating, plumbing, tile roofing, fireproof interior finish, and electric lighting. Power plant equipment will cost about $15,000.

Akron, Ohio.—Goodyear Tire & Rubber Co. plans to erect a new $500,000 factory building.

Alliance, Ohio.—An election will be held April 8 to vote on the issuing of $400,000 bonds for a municipal electric plant and $100,000 for parks and play grounds.

Cleveland, Ohio.—Engineers Barclay, Parsons & Klapp, New York City, will have plans completed by May 1 for the Rapid Transit Subway Co. $5,000,000 in bonds will be issued. Address local representative H. M. Grincherhoff, 207 Leader News building.

Cleveland, Ohio.—Home Specialty Co. has let contracts for a factory building to cost $70,000.

Cleveland, Ohio.—Forbes Chocolate Co. will build a plant, the first unit of which will be erected at once and will cost $250,000. Plant will have 100,000 sq. ft. of floor space.

Columbus, Ohio.—Berwind-White Coal Mining Co. is planning to construct an $800,000 power plant to furnish current for the eight mines of the company in the Windber, Pa., field. It is reported that the company will open two new mines in the Windber field within the next 12 months.

Galion, Ohio.—Extensions will be built to the plant of the Galion Metal Vault Co., which are provided for in an increase of the capital stock of the company from $200,000 to $400,000.

Portsmouth, Ohio.—The Electric Light Committee has decided to place 25 additional lights. Address Chairman Westphal.

Waseon, Ohio.—The city trustees have been authorized to purchase wire, motors and other electrical equipment without advertising; also

the purchase of pipe, pumps and other equipment.

Springfield, Ill.—Municipal Lighting Co. of this city has been awarded the contract for lighting the court house and the county jail for the next 12 months.

Bluffton, Ind.—The Bluffton city council is considering the purchase of a new 1000-kw. turbine engine for the municipal electric lighting plant. This step is made necessary for the increased business of the plant, including the sale of current to the recently organized Linn Grove Light & Water Co. Local industrial institutions are also using increased amounts of current from the city plant. The new turbine, if installed, will make the plant almost in duplicate, as there is already a 600-kw. turbine in service. The purchase of the new turbine for about $33,000 is dependent on the sale by the city of a 400-kw. Corliss engine now in the local plant. It is not large enough to handle what will be the minimum load at the plant. Address city clerk, Bluffton, Ind.

Brazil, Ind.—Liberty Storage Battery Co., Chicago, will purchase factory building formerly occupied by plant of Brazil Stamping & Manufacturing Co. The factory will be removed from Chicago to Brazil.

Columbia City, Ind.—A company has been organized at Larwell, Ind., to establish an electric lighting plant in that village.

Decatur, Ind.—Farmers' Light & Power Co. has organized with a capital of $5000 to furnish light and power to Union and Root townships from the Dent school house. John D. Nidlinger, president.

East Chicago, Ind.—Indianapolis Water Co. has closed a contract with the Warner Construction Co. of Chicago for the building of a water filtration plant in East Chicago for the East Chicago & Indiana Harbor Water Co., which will cost when equipped, $333,000. The new filtration plant will be the most modern in the State of Indiana. It will have six filter units, each with a capacity of one and one-third million gallons every 24 hours each making a total capacity of 8,000,000 gal. a day. The plant will be built to permit an expansion to a capacity of 16,000,000 gal. It will have a sediment basin with a capacity of 1,500,000 gal. Chemical and filter houses will be built and extensions made to the boiler house and addition to the pumping house. One new boiler and two new pumps are to be installed.

Fort Wayne, Ind.—The new three-story Spillman building, 60x60 ft. in dimensions, will be begun at once. Total cost $75,000. Henry Hilgemann, Fort Wayne, Ind., is the contractor.

Indianapolis, Ind.—The Indiana Public Service Commission and about twenty members of the Indiana Independent Telephone Association have taken steps to form a committee of engineers which will make a study of telephone companies with a view to determine how to differentiate between maintenance and depreciation accounts. The Commission and the telephone company men will likely appoint a joint committee and a system of accounting for the companies may be based as the results of the investigation. The Commission and the telephone men will meet again on April 2 to further discuss the relation of the Commission to the utilities in this respect.

Indianapolis, Ind.—The city has closed a contract with the Welsbach Street Lighting Co. of America, which holds the city agreement for gas street lamps, for approximately 150 column lights and 43 electric lights operated by the Merchants Heat & Light Co. will be discontinued. The board of public works has the right to discontinue 50 electric lights this year with the Merchants Light & Heat Co. under the city's contract.

Muncie, Ind.—Board of Public Works has recommended a new city hall, to be erected at cost of $100,000.

Bismarck, Ill.—Alvin Grain & Electric Co. has incorporated to construct and operate an electric light and power service in the unincorporated village of Bismarck, Vermilion county.

Centralia, Ill.—Duquoin Utilities Co. has purchased plant of the Centralia Ice Co. Battery machinery will be installed and the plant will be operated by electricity. Address William Farrell, manager.

Cerro Gordo, Ill.—Central Illinois Electric Co. has applied to the Illinois Public Utilities Commission for approval of sale covering the Cerro Gordo system, including the villages of Cerro Gordo and Oakley and intervening territory to the Cerro Gordo Electric Light Co. The latter company also asks for a certificate of convenience and necessity to operate an electric light, heat and power system in Cerro Gordo and Oakley and for authority to issue $20,000 of its capital stock. The company plans to extend its lines and to add to its equipment and service.

Pittsfield, Ill.—Virgil Hoover is contemplating the installation of an electric light plant at Milton, Ill., which will furnish current for business houses, residences and street lighting.

Detroit, Mich.—Following the reaching of a tentative agreement by the city railway commission and officials of the Detroit United Railway for the purchase by the city at a cost of $31,500,000 of the company's properties in Detroit, the city council has decided to submit the proposition to the voters at the April 7 election. If the plan carries and the purchase is made the city will assume ownership and control of the lines July 1, 1919. The agreement calls for an initial payment by the city of $15,000,000. The stock of the Detroit United Railway is largely held in Canada.

Jim Falls, Wis.—Wisconsin Minnesota Light & Power Co. has prepared plans for a hydroelectric station and dam. Address E. A. Pierce, vice-president, 2 South Barsloe street, Eau Claire, Wis.

Sturgeon Bay, Wis.—High Falls Co. contemplates extending the electric power line from Green Bay to Sturgeon Bay. Address W. J. Wadsworth.

Oklee, Minn.—Estimated cost of necessary water and electric system improvements is $15,000.

St. Paul, Minn.—Villaume Box & Lumber Co. has purchased the Gribben Lumber Co. and has moved all the machinery of the latter company to its plant. The Villaume company is in the market for 20 to 30 electric motors.

St. Paul, Minn.—Swift & Co. at South St. Paul are negotiating for the purchase of a 150-hp. motor to operate a vertical, centrifugal deep well pump, which will increase electric energy requirements supplied by the Northern States Power Co. W. H. Schmelzel Co. has purchased a tract of land upon which will be established the greatest tractor distributing center in Minnesota. It is estimated the improvement will eventually represent an investment of more than $1,000,000.

Stillwater, Minn.—Northern States Power Co., Stillwater division, has secured contract with the State Penitentiary for 1000 kv-a. of electric energy, which is 500 kv-a. greater than the previous contract. Arrangements have been completed by the Twin City Forge & Foundry Co. for the assembling of steel barges, and the plant will be in full operation by April 1.

Bloomfield, Iowa.—The City Council has appointed a committee to investigate the proposition of new equipment for an electric light plant. It is planned to change the system from 110-volt direct to 2300-volt, 60-cycle, three-phase and reconstruct the line. One unit of 225-kw. capacity, direct connected to a Corliss engine and one unit of 100 kw., 160,170 or 180 r. p. m. will probably be installed.

Davenport, Iowa.—McCarthy Improvement Co. will erect a one-story tool house and garage, 40x150 ft., brick and concrete, to cost $17,000.

Davenport, Iowa.—Ewert & Richter Transfer Co. will erect a fireproof warehouse, 128x150 ft. in size.

Dubuque, Iowa.—It is said that the City Council has practically decided on a new five-year contract with the Dubuque Electric Co. for the furnishing of street lighting for the city. A contract will be drawn up between the city and company for a term of five years at the rates asked in the short and long term contracts but with the electric company paying the installing, moving or transforming cost of one hundred lights during the five years. The city will probably have the right of installing, moving or replacing with smaller or larger candlepower 100 lights during the five years of the contract. Under one plan suggested they can install or change 100 lights in the first year, another plan calls for 36 lights the first year and 16 each year thereafter.

Marshalltown, Iowa.—The question of issuing bonds to secure municipal lighting will be submitted to vote. Address city clerk.

Webster City, Iowa.—The local electric light plant suffered heavy

loss from windstorm, three smoke stacks having been blown down.

Berryville, Mo.—Union Electric Light & Power Co. has under consideration the placing of a new boiler, the installation of a water-tube boiler or the putting in of an oil engine. These improvements are to be installed at once.

Butler, Mo.—Improvements to the city light plant are being considered or the proposition of having lines from other towns extended to Butler to furnish current.

Kansas City, Mo.—The new building of the Electric Theater will demand the installation of a large amount of electrical wiring and fixtures.

Kansas City, Mo.—Linwood Boulevard Methodist church will complete present edifice at a cost of $75,000, bringing the total investment up to $125,000.

Kansas City, Mo.—An elaborate amount of electrical wiring and fixture installation will be required in the new 14-story steel, brick and stone building of the Kansas City Club, to be erected at a cost of $1,250,000.

Macon, Mo.—The city will expend $45,000 on power plant, including new unit, engine, generator and settling basin. The specifications include concrete reservoir and installing 400 to 450 kv-a. unit. Bids will be asked. Engineer Frank Wilcox, Syndicate Trust building, St. Louis, has prepared plans. Address William H. Martin, city clerk.

Altamont, Kans.—Election will be called soon to vote on a $25,000 bond issue for electric lights. Archer & Stevens, 609 New England building, Kansas City, Mo., engineers.

Eldorado, Kans.—There is a movement for the city to combine the new water plant with the electric light plant. If the city starts building a new plant this year, it can be completed by the time the Kansas Gas & Electric Co.'s franchise expires in 1922.

Independence, Kans.—The arc street lights are soon to be replaced by tungsten lights. Plans for a new "white way" are also under consideration.

Oswego, Kans.—Election will be held April 1 to vote $50,000 for an up-to-date lighting plant.

Scranton, Kans.—An election will be held March 27 for the purpose of deciding whether $12,000 in bonds shall be issued to build a transmission line for carrying electric current from Burlingame. Wm. Brickson, city clerk.

Topeka, Kans.—The senate appropriated $200,000 for a power plant for the Rosedale Hospital and the house allowed $150,000.

Uniontown, Kans.—A mass meeting was called recently to discuss the proposition of establishing a city electric lighting plant. There was strong sentiment in favor of a city owned plant.

Holdrege, Neb.—The election for the purpose of voting on a $68,000 bond issue for the construction of a municipal electric light plant carried. Plans have been prepared by the city council covering the new plant and work will commence within 30 days. The lighting units are to be installed at the city water works, two units being installed, one 220-kw. generator and one 110-kw., to be driven by Corliss steam engines. About 70 miles of distributing lines is included in the estimate as well as an ornamental street lighting system for the business district.

Omaha, Neb.—Western Motor Co. will erect six-story building, 132x138 ft. for office, garage and showroom purposes. George L. Fisher is the architect.

Sterling, Neb.—$16,000 electric light bonds have been authorized by vote. Address city clerk.

Lisbon, N. D.—Lisbon Electric Light Co. will make improvements to its plant and equipment. Cost $15,000.

SOUTH CENTRAL STATES.

Louisville, Ky.—The eight-story Kenyon building, on the west side of Fifth street, between Main and Market streets, has been purchased by the Standard Savings & Loan Co. of Paducah, Ky., who will expend $30,000 on improvements on the building.

Chattanooga, Tenn.—Southern Cities Utilities Co. has filed notice of an increase in its capitalization from $500,000 to $2,500,000, to provide for expansion.

Nashville, Tenn.—An election will be held here April 3 to vote on the question of issuing $60,000 in bonds to install boiler in the electric light plant. Address city commissioner.

Ripley, Tenn.—The city has called a special election on May 1 to vote on the issuance of bonds for $150,000 to provide for the installation of a new electric light and water system. Calfin Conner is mayor.

Mobile, Ala.—Definite announcement was made that H. M. Byllesby & Co., owners of the Mobile Electric Co. plant, would build a new power station sufficiently large to carry the entire lighting and power load of the city. The new plant will be erected in addition to the present power house of the company at Royal and St. Louis streets, which was partially wrecked by an explosion Feb. 21. The present plant will be retained as an auxiliary unit.

Senatobia, Miss.—The mayor and board of aldermen at a meeting held recently approved the issuance of bonds by the city in the sum of $15,000 for the purpose of constructing a new and modern electric light and water plant. The present plant has been in service for about 15 years. The new plant will furnish lights for Coldwater, six miles north, and for the county agricultural high school. These bonds will be issued at the April meeting of the board and work will begin on the construction of the plant about that time.

Helena, Ark.—Helena Gas & Electric Co. contemplates the construction of a new electric light plant in the near future.

Blanchard, Okla.—The city council has made arrangements with an Oklahoma City engineering company to make preliminary survey of the town, to estimate the amount of bonds necessary to build a light and water plant.

Frederick, Okla.—The city is having plans prepared for extension and improvement of electric light plant; also considering installation of ornamental electric lighting system on Grand avenue. Address mayor.

Newkirk, Okla.—Plans are progressing for the reconstruction of the waterworks and light plant.

Oklahoma City, Okla.—The addition of $2,000,000 to the capital stock, now standing at $10,000,000, of the Oklahoma Producing and Refining Co. foreshadows large extensions to its refining plants.

Perry, Okla.—The city plans to expend $100,000 to improve the electric light plant and water works. Address mayor.

Tishomingo, Okla.—Election will probably be called April 1 to vote bonds for the erection of an electric light and ice plant, owned and operated by the city.

Tahlequah, Okla.—Plans are being made for the installation of a municipal light and power plant to cost approximately $65,000.

Woodward, Okla.—Election held recently to vote $30,000 bonds with which to adequately equip the water and light plant, failed to carry.

Austin, Tex.—The City Council appropriated $10,000 to place cables in the conduits already laid by the Water & Light Co. on Congress avenue, and the alleys and streets adjacent. When the cables are laid, the overhead light wires will be placed under ground.

Brownsville, Tex.—Extensive improvements for practically every outpost and cantonment in the Brownsville district will be started at once. One of the most important improvements is the remodeling of the telegraph and telephone communications.

Carbon, Tex.—The Commercial Club of Carbon has raised a fund for installing an electric light and power plant.

Dallas, Tex.—It is announced by Wiley Blair, chairman of the commitee of the Dallas Chamber of Commerce which is promoting the construction of an interurban electric railway between Dallas and Wichita Falls, a distance of about 125 miles, that the money for the survey for the proposed line has been raised. The Dallas Northwestern Traction Co. is promoting a similar project.

De Leon, Tex.—George H. Ford, of Dallas, owner of the local electric light and power plant, announces that he will install new machinery and equipment at a cost of about $40,000.

WESTERN STATES.

Ronan, Mont.—An electric light and power plant will be erected. Stephen Walner of Butte, owner.

Lamar, Colo.—The city of Lamar was authorized by the Public Utilities

Commission to proceed with a bond issue election April 1, calling for $45,000, for the construction of an electric light and power plant. The city is at present supplied with power and light by the Intermountain Railway, Light & Power Co., which has been regarded as insufficient by the commission to meet the city's needs.

Phoenix, Ariz.—Snowflake & Taylor Irrigation Co. is to install an electric light plant to supply light, heat and power to the towns of Snowflake, Taylor and Shumway in Navajo county.

Porterville, Cal.—J. H. Berkeley, a consulting engineer of Southern California, has been retained by the city council to prepare plans for a municipal gas plant. The council also has under consideration a municipal power plant, the Mount Whitney Power & Electric Co. having applied for another increase in rates.

San Diego, Cal.—F. E. Newberry Electric Co., Los Angeles, has submitted a low bid for the construction of a flood lighting system at the naval coaling station at La Playa. The wires will be installed in concrete conduits.

Seal Beach, Cal.—The city will install a rotary pump and motor and two auxiliary booster pumps in connection with the sewerage system which it plans to construct. This work is estimated to cost about $40,000. Olmsted & Gillelen, 112 Hollingsworth building, Los Angeles, engineers.

Stockton, Cal.—General Motors Co. contemplates the establishment of an additional large plant for the manufacture of tractors, trucks and farm implements at Stockton.

PROPOSALS

Copper Wire, Lead Wire, Connectors, Etc.—Bids will be received until 10.30 a. m., March 25, at Washington, D. C., for furnishing wire rope, copper wire, lead wire, brass wire, connectors, condulets etc. Address A. L. Flint, general purchasing agent, Panama Canal, Washington, D. C.

Electric Elevator Pumps.—Bids will be received until April 15 for installing three electric triplex elevator pumps in the court house at Omaha, Neb. J. A. Wetmore, supervising architect, Treasury Department, Washington, D. C.

Power Plant Equipment.—Bids will be received until 1 p. m. April 2 for remodeling the municipal power plant, and furnishing and installing complete steam-electric power plant equipment at Hibbing, Minn. Address D. D. McEachin, secretary.

Power Plant and Transmission System.—Bids will be received until 9 a. m. March 28, for the installation of a steam power plant and an electric transmission system, at Marshall, Mo. The work will cover the material, equipment and labor. Bidders are invited to submit bids on all or any part of the work as specified.

Cable, Generator Set, Machine Tools.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for 3000 ft. electric, 500,000 circular mils cable, for delivery at Washington, D. C., (Schedule 3852); generator set, meter, generator cells, etc., to be delivered at Washington, D. C., (Schedule 3849); one horizontal, motor-driven, boring mill, delivery at Washington, D. C., (Schedule 3833); one portable, hand or breast, electrical drill, for delivery at Charleston, S. C., one alternating current dry grinding machine, delivery at Charleston, S. C., (Schedule 3855); one Universal motor-driven milling machine, delivery at Washington, D. C., (Schedule 3835), and two motor-driven pipe threading and cutting off machines, to be delivered at Puget Sound, Wash., (Schedule 3830).

INCORPORATIONS

New York, N. Y.—Circle Electric Supply Co., Inc. Capital, $10,000. To manufacture and deal in electrical goods. J. Hechman, L. Davis and D. Lang, 2274 Seventh avenue, are the incorporators.

New York, N. Y.—Efficiency Electric Corporation. Capital, $150,000. To manufacture electrical machinery and specialties. T. L. Ernst, F. H. Butehorn and R. A. McLean, 318 74th street, Brooklyn, are the incorporators.

New York, N. Y.—J. F. Delehant Electric Sales Corporation. Capital, $8000. To sell electric goods and supplies. M. B. Delehant, H. Van Alst and P. J. Murray, 33 West 98th street, are the incorporators.

Pittsburgh, Pa.—Devon Electric Co. Capital, $50,000. To manufacture electric goods of various kinds. W. I. Bickford and associates are the incorporators.

Connellsville, Pa.—De Polo's Heating System Co. Capital, $20,000. To manufacture and install heating systems, etc. H. E. Walton is the principal incorporator.

Melbern, Ohio.—Melbern Telephone Co. has incorporated with a capital of $4000 by Edwin Stenger, Daniel D. Rinkel and others.

Savannah, Ga.—Universal Light & Power Co. has incorporated by L. D. Wylly, F. B. Mosely and G. W. Spitz.

Pierceton, Ind.—Pierceton Light & Water Co. has incorporated with a capital of $35,000 to furnish light and power. J. T. Brosnahan, director.

New York, N. Y.—United States Electric Manufacturing Corporation. Capital, $50,000. To manufacture electrical specialties, etc. Incorporators: A. Caming, J. J. Lazaroe, and G. Frankel, 666 West 162nd street.

New York, N. Y.—Railway & Power Equipment Co. Incorporated in Delaware with a capital of $5,000,000. To manufacture power machinery, railway equipment, etc. Incorporators: K. I. Gartland, New York; H. Rubin, and M. Gross, Brooklyn.

New York, N. Y.—Ridishaw Manufacturing Co., Inc. Capital, $250,000. To manufacture telephone and sound transmitting devices. Incorporators: M. Ganya, L. J. Haines, and J. Connors, 80 Broadway.

New York, N. Y.—Rector Electric Co., Inc. Capital, $10,000. To manufacture electrical specialties, etc. Incorporators, A. Goetze, W. Claman, and F. W. Martin, 320 East 156th street.

Memphis, Tenn.—Hawkins Electric Co. Capital, $10,000. To manufacture electrical goods, etc. Incorporators: B. T. Hawkins, Lloyd L. Gough, and J. Bloomfield.

Natchez, Miss.—Natchez Electric Co. Nominal capital, $5000. To manufacture electric appliances. Incorporators: Frank Hootsell, Maurice Block, and A. I. Hootsell.

St. Albans, W. Va.—St. Albans Light, Water & Ice Co. Capital, $100,000. Forming a consolidation of the Campbell Brothers Ice Co. and the St. Albans Water & Electric Co. It is understood that the corporation is considering plans for improvements and extensions in the plants, to provide for an increase in the present capacity.

NEW PUBLICATIONS

Saving Coal in Steam Power Plants.—The Bureau of Mines, Department of the Interior, has published Technical Paper 217, entitled "Saving Coal in Steam Power Plants." This is a reprint of Engineering Bulletin No. 2 prepared by the United States Fuel Administration in collaboration with the Bureau of Mines. It sets forth in a clear manner the underlying principles of power plant economy, the determining factors, and the method of applying them in such manner as to be of greatest service to the owner, manager and engineer of the plant. The saving of coal in steam power plants, both isolated and central station, is discussed and emphasizes the importance of the human element in this connection. It enumerates the preventable losses in boiler-plant operation, the principal ones being a dirty boiler, causing a loss up to 25%; leaky setting, loss up to 15%, and poor firing, loss up to 40%, and points out how these conditions may be improved. It stresses the importance of keeping a systematic record of operation, the utilization of steam after delivery to the engine and the use of exhaust steam. A folded insert shows the relative heat lost in the steam piping, engine, condenser, etc., and points out most forcibly the great loss of heat in the condenser when industrial applications cannot be employed. Copies of this valuable bulletin may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy.

Personal

G. E. Tripp Awarded Distinguished Service Cross—Dr. Jewett to Serve on Engineering Foundation Board—Changes

EDWARD I. PRATT, who recently was discharged from the army, has returned to the Kellogg Switchboard & Supply Co., Chicago, in the capacity of advertising manager.

GEORGE SCHUYLER, who for the past 18 years has been connected with the Hazard Wire Co., has resigned to associate himself with Frank E. Watts, Inc., 30 Church street, New York, as sales manager.

HARRY L. KNIGHT, Medford, N. J., has been appointed by Governor Edge to succeed Ralph W. E. Donges, recently resigned, on the Board of Public Utility Commissioners. Andrew Gaul, Jr., Bergen county, has also been appointed a member of the commission.

T. W. BEHAN, for the last 20 years connected with the General Electric Co., Fort Wayne, Ind., has resigned to accept the position of factory manager of the 1900 Washer Co., at Binghampton, N. Y. Mr. Behan has for many years been in charge of the fractional horsepower motor sales department of the Fort Wayne plant of the General Electric Co. He was presented with a handsome leather traveling bag by his department associates. He is succeeded by A. J. Francis, who has been with the Chicago office of the General Electric Co. for a number of years.

DR. FRANK B. JEWETT, chief engineer of the Western Electric Co., was recently elected to membership on the Engineering Foundation Board as one of the two trustees representing the American Institute of Electrical Engineers. Dr. Jewett is well known to the scientific world, especially in the field of telephony. He was born in Pasadena, Cal., in 1879, and was graduated from Throop Polytechnic Institute of Pasadena, Cal., in 1898 with the degree of A. B., in electrical engineering. From 1898 until June, 1902, he was a student in the University of Chicago, receiving the degree of Ph. D. in 1902. In 1904, Dr. Jewett became connected with the American Telephone & Telegraph Co., and for about eight years was in charge of transmission development work for the Bell System. While in this position as transmission engineer, the loading of eight-gauge circuits was perfected; phantom cables and phantom loading for open wires and cable were developed, the New York to Denver line and the Boston to Washington underground cable were engineered. Dr. Jewett began work on the transcontinental line, retaining general charge of the transcontinental engineering until the line was completed. In April, 1912, he became assistant chief engineer of the Western Electric Co., having charge of development and research work. In December, 1916, he was appointed chief engineer of the company to succeed C. E. Scribner and has since served in this capacity.

CALVERT TOWNLEY, assistant to the president of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., presented a very important paper before the meeting of the American Institute of Electrical Engineers held in Boston, March 14, on the subject "Some Possibilities of Steam Railroad Electrification as Affecting Future Policies," which is reproduced in full in another part of this issue. Mr. Townley entered the electrical field at the time when the alternating-current system was in its beginning, and he has given its development very close study. His early experience combined both commercial and engineering matters, and his engineering training and the connections

Calvert Townley.

he has established have given him an understanding of electrical apparatus and electrical operation which has made his administrative work very practical and highly effective. Mr. Townley became connected with the Westinghouse company about 26 years ago and to him much credit is due for the large measure of success which has attended the commercial development of the apparatus designed and manufactured by that organization. He was for six years connected with the New York, New Haven & Hartford railway system, going to Hartford originally to take charge of the electrification work for the system, and also to manage its related trolley properties. He organized and conducted the investigation of the electrification problem out of New York. In 1911 he severed his connection with the New Haven system to re-enter the services of the Westinghouse company. At the annual meeting of the Engineering Council held recently Mr. Townley was reappointed chairman of the Water Conservation Committee, also reappointed a member of the Reconstruction Committee of the Council.

Mr. Townley is a prominent member of the American Institute of Electrical Engineers and has served on its board of directors and various committees.

CHARLES SPAULDING, of Newburyport, Mas., has been appointed manager of the Wakefield (Mass.) municipal gas and electric department.

A. S. BLAGDEN was elected president at the organization meeting held recently by the directors of the Air Reduction Co., Inc., New York, N. Y.

H. L. GARBUTT, manager line material section, Westinghouse Electric & Manufacturing Co., East Pittsburgh, is visiting the Pacific Coast offices of the company. He was in Seattle recently.

ERNEST HUTCHENS, formerly city electrician of Bluffton, Ind., has accepted a position as superintendent of the Linn Grove Light & Power Co. He is succeeded at Bluffton by Ernst Hutchens.

C. C. WALLACE, formerly manager of loading of munitions section of the Stenotype Co., Indianapolis, Ind., is now director of development and service of the Powdered Coal Engineering & Equipment Co. of Chicago.

THOMAS F. JOHNSON, superintendent of transmission and distribution of the Georgia Railway & Power Co., Atlanta, Ga., has been promoted to the position of general electrical superintendent, succeeding S. A. Redding, resigned. His promotion comes as a reward of unusually efficient service in the transmission department. He is regarded as one of the most capable electrical engineers in the South.

HERMAN RUSSELL, assistant general manager of the Rochester Railway & Light Co., Rochester, N. Y., was elected general manager of the company at a meeting of the board of directors held recently. He succeeds James T. Hutchins, former vice-president and general manager, who became president of the company last December.

E. L. SIMPSON has been appointed manufacturing superintendent of the Fort Wayne plant of the General Electric Co. He has spent the last two years at Fort Wayne, going there from Schnectady, N. Y. He will have for his two assistants Max Holz and A. Kaysor. Mr. Holz came to the Fort Wayne plant from Madison, Wis., where he was employed as a special designer and held the same position at Fort Wayne. Mr. Kayser for some time has been superintendent of Section A of the Fort Wayne plant, or that part of the works located east of Broadway. With his two assistants Mr. Simpson will have charge of all of the manufacturing done at the plant, being one of the most important positions offered at the Fort Wayne works.

H. A. WHERLE has been transferred to Paris, Ill., as manager of the plant of the Central Illinois Public Service Co. He was formerly stationed at Tuscola, Ill.

C. H. MATSON has been named superintendent of buildings and maintenance of the Fort Wayne plant of the General Electric Co. He formerly occupied the position of foreman of the factory engineering.

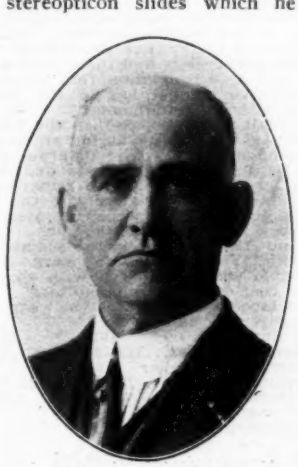
B. C. EVANS has been appointed tool supervisor for the entire plant of the Fort Wayne branch of the General Electric Co. He was formerly foreman of the tool making department. Mr. Evans succeeds in this position Frank Hoffman. His assistant will be John Roebel and the two men will have charge of all of the tools produced at the plant. A tool committee has also been appointed and will review and give advice upon all matters pertaining to special tools, fixtures, moulds, jigs, dies and other appliances. The committee will be composed of E. L. Simpson, Max Holz, A. Kaysor and B. C. Evans.

WILLIAM L. ABBOTT, of the Commonwealth Edison Co., Chicago, has retired as president of the board of trustees of the University of Illinois after faithful service in this capacity for the last 10 years. Mr. Abbott remains, however, a member of the board of trustees but wished to be relieved of the responsibilities as president of the board. He is a graduate of the electrical engineering course of the University in the class of 1884 and has always taken a deep interest in the welfare and growth of the institution. He is succeeded by Robert F. Carr, president of the Dearborn Chemical Co. of Chicago.

CAPT. J. H. MOSELEY recently received his discharge from military service and joined the advertising department of the Western Electric Co. For three years he was advertising manager of the Texas Power & Light Co., Dallas, Tex. In August, 1917, he entered the United States Army, soon becoming first lieutenant of the Coast Artillery service. Later he was transferred to the Aeronautic Service, being at the same time promoted to a captaincy. Since leaving the service at one of the Pacific Coast camps and joining the Western Electric organization, Captain Moseley has been visiting the company's numerous branch houses on his way to New York City, where he will make his headquarters.

GEN. GUY E. TRIPP was recently decorated with the United States Government distinguished war service medal, which was awarded him for his excellent work in systematizing methods and practice, resulting in the hearty co-operation of industries producing ordnance material for the army. General Tripp's army career has been marked by a series of successes. Entering the army with the rank of colonel as chief of the Production Division of the Ordnance Department, he was later promoted to the rank of brigadier general as assistant chief of Ordnance. General Tripp has proven himself to be a man of wonderful executive and organization ability. It was he who conceived the idea that production work of the Ordnance Department should be handled from different points throughout the United States instead of through one big head in Washington. This scheme worked out to perfection and was the means of speedy and efficient production. It is to men like General Tripp that our country is indebted for the great part they played in assisting in the speedy and victorious end of the world war. Before going into service General Tripp was president of the board of directors of the Westinghouse Electric & Manufacturing Co., to which position he returned after the signing of the armistice, and the cessation of hostilities.

THOMAS H. DAY, recently appointed chairman of the Committee of Arrangements for the forthcoming convention of the National Association of Electrical Inspectors, is associated with the engineering department of the New England Insurance Exchange. He devotes much of his time in explaining the National Electrical Code to the electrical interests in his territory and in educational institutions, having over 500 stereopticon slides which he has



Thomas H. Day.

collected during the past 15 years. He entered the electrical field about 43 years ago, his work having been assisting in the installation of thermostats for a fire alarm system in the coal bunkers in the Battleship *Tennessee*.

E. V. ADAMS has been appointed railway sales engineer of the Western Electric Co., New York, succeeding G. K. Heyer. Mr. Adams has been in the employ of the company since 1910 when he entered the railway sales department of the Chicago house. He was transferred to St. Louis in 1912 and the following year went to New York where his headquarters will remain.

Obituary.

LESTER BLUMBERG, connected with the Colony Construction Co., in the capacity of electrical engineer, died on March 8 at his home, 373 Monroe street, Brooklyn, N. Y. Mr. Blumberg was 43 years of age.

W. R. JOHNSON, treasurer of the Wisconsin State Association of Electrical Contractors and Dealers, and owner of Johnson's Electric Shop, Wausau, Wis., died in that city on March 8. Mr. Johnson had built up a very enterprising electrical contracting and merchandising business in the city and was for many years very actively associated with the state association, on whose committees he has served repeatedly and whose interests he tirelessly promoted.

JAMES E. COLE, wire commissioner of Boston, Mass., one of the most active members of the Electrical Committee of the National Fire Protection Association, died at his home at Roxbury, Mass., Feb. 22. During his life Mr. Cole stood in the front rank of those charged with the municipal regulation of electrical equipment and in his death the industry loses one of its most substantial and progressive figures. The following account is taken from the resolutions adopted by the Electrical Committee. Mr. Cole's active connection with the Electrical Committee began in 1899, when he was appointed a member of a sub-committee to consider possible improvements in the method of installing the ground return wire of electric railway systems, although he had been actively co-operating with the committee for several years prior to this time. From then on he continuously served on committees, being chairman of the Theater Committee and the Gas-Filled Lamp Committee, and a member of the Switch and Cut-out Committee. When, in 1911, the Electrical Committee was reorganized to allow the appointment of members from other than the insurance interests, Mr. Cole was made a member representing the National Electrical Inspectors' Association of which he was president.

He entered the wire department of the city of Boston as deputy inspector in 1891, and was appointed chief deputy in 1901. In 1908 he was appointed wire commissioner of that city and, through the efficient discharge of his duties, won the merited honor of being reappointed by three successive mayors. The present inspection system of Boston, which has been recognized by many as the most comprehensive in the country is largely the result of his efforts and supervision. He was a member of the A. I. E. E. and numerous other organizations.

EDWARD BELL FIELD, SR., president of the Mountain States Telephone Co., Denver, Colo., died Feb. 20 at the age of 69 years after a long illness. Mr. Field was a New Englander by birth and education. In 1865 he entered the wholesale woolen business in Boston. His health failed and in 1879 he was forced to go to Colorado to reside. He began life in the West as a telephone operator and in 1881 was appointed manager of the operating department of the Colorado Telephone Co. He became general superintendent of the company in 1885 and vice-president and general manager in 1890. He organized a number of other companies and in 1898 he was elected president of the various companies consolidated into the Mountain States Telephone Company, operating in eight states. He was also president of the Tri-State Telephone Company and a director of the First National Bank of Denver. He served as a director and as treasurer of the Denver Chamber of Commerce, trustee for two years of Denver University and was a member of the advisory board of Governor Buchtel in 1907. Mr. Field belonged to many clubs and literary and scientific organizations, many of them national in character. He had a wide interest in mountain biology and devoted much of his spare time to the study of human physiology and psychology, in which he was much interested.

Financial News

When Prices Drop.

B. M. Anderson, Jr., Ph. D., of the National Bank of Commerce in New York, is the author of pamphlet recently issued entitled "When Prices Drop," which is a well-reasoned analysis of the financial situation of our country and offers suggestions for the future that will prove of considerable value to bankers, business men and statesmen. He states that although all prediction in economic matters is to be accepted with caution, we may except the Civil War parallel to hold so far as falling prices and the absence of crisis caused thereby are concerned. But the continuance of business activity will have to rest on a square deal to labor, and on a generous policy of lending on the part of the United States, the one great country which has a large surplus. Europe has a sound basis of credit to offer. Her people are intelligent, efficient and accustomed to pay their debts. They are impoverished in the present, but their industry and frugality will give them wealth in the future. Their great war debts, so far as held by their own people, need not seriously weaken their credit with the outside world. Even those weaker countries with large foreign debts may still secure new capital from outside on "receiver's certificates" or on pledge of special revenues. Our own interests are bound up in a magnanimous foreign policy. Especially must we let gold go freely when it will. Unless the rest of the world can revive its commerce and industry, it cannot buy our goods or pay its debt to us. International trade is a matter of reciprocal advantage. All the world shares in the prosperity of a country which plays the game fairly. But the game of commerce must not be played in the future as an adjunct to piratical diplomacy—nor must the game of diplomacy be played as an adjunct to selfish business. We must free the world from the German spirit, as well as from the German armies.

Customer Ownership Plan Favored.

The following article appeared recently in the Investors' Guide column of the Chicago Tribune:

"A study of the list of several hundred cities where traction and other utility companies have obtained increased rates in the last year tends to confirm the opinion that people should invest their money at home.

"Companies whose securities are held largely by residents of their respective localities have fared better than others. The reason for this is plain. If a considerable number of citizens of a town own stock and bonds of its street railway, the rate-making board cannot help seeing that to refuse a necessary increase will be merely to take the property of part of the citizens and gradually distribute it to the others until bankruptcy stops the process. The people whose property is imperiled are on the ground where they can and do use their influence in protecting their interests.

"Rate making boards, of course, should act as courts of justice and treat both sides fairly. It seems, however, that in practice they often follow the line of least political resistance and sacrifice the just claims of unknown owners in order to grant unjust demands of ever present and insistent patrons.

"The investor who owns bonds of a company in a distant state is unknown and negligible to the rate-making authorities, but the man whose money is invested in home companies must be considered."

Central Illinois Company Report.

The Central Illinois Public Service Co. reports operating income of $871,720, after all charges except interest in the calendar year 1918. This compares to $871,658 in the previous year. Net after interest amounted to $221,453, as compared to $282,500 in the previous year. Preferred dividends amounted to slightly more than net earnings, being $223,081. In addition the company paid common dividends of $90,000 out of surplus.

American Telephone Earnings Show Substantial Gains.

The American Telephone & Telegraph Co. in the 12 months ended Dec. 31, 1918, with the properties operated by the Government in the last five months of the year, received larger net income—partly on the basis of its own operating income for the first part of the period and partly on the basis of the compensation guaranteed by the government—than it earned from its own operations in 1917. The company's annual report shows that the balance available for dividends and reserve for contingencies in 1918 was $43,901,321, equal to 9.93% on $441,947,338 capital stock outstanding, compared with a balance of $38,471,106 in 1917, equal to 8.83% on $435,658,725 capital stock.

Reporting to stockholders on the subject of "combination and regulation," Theodore N. Vail, president of the company, says:

"There is little doubt remaining in the minds of the public but that regulated monopoly is better than unregulated Government ownership, and there is no longer any extensive conviction that there can be effective competition in the electric transmission of intelligence."

Mr. Vail presented also, in the form of a diagram, an argument for an increase in telephone rates. The diagram shows the rise in commodity costs and wages while telephone rates have remained almost stationary. Relatively to the price of commodities in general the rates have decreased 30%, it is pointed out.

"About 12% increase in rates is needed," says Mr. Vail, "which appears almost negligible when compared with advances in the cost of other commodities."

The income account for the year, with comparison, is as follows:

Earnings—	1918.	1917.
Dividends	$19,527,451	$28,894,254
Interest and other revenue	18,022,220	19,455,261
Tel. traffic (net)	*4,726,096	7,887,548
Compensation—Acct. government contract, 5 months, 1918	18,780,395	.....
Total	$61,056,162	$56,237,063
Expenses	6,763,146	7,296,597
Net earnings	$54,293,016	$48,940,466
Interest	10,391,695	10,469,360
Balance	$43,901,321	$38,471,106
Dividends	35,229,699	32,481,614
Balance	$ 8,671,622	$ 5,989,492
Approp. for contingencies	5,000,000	2,500,000
Added to surplus	$ 3,671,622	$ 3,489,492

*Seven months 1918.

Net Earnings of Western Electric Show Increase Over 1917.

According to the annual report to stockholders, the total sales of the Western Electric Co. for the year ending Dec. 31, 1918, aggregated $145,226,000, which compares with $150,340,000 in 1917, $106,987,000 in 1916 and $63,852,000 in 1915. Of the total sales $67,860,000 were to the Associated Bell Telephone Companies, $21,825,000 to the War and Navy Departments of the United States Government and $55,541,000 to other customers. The net earnings of the companies, after meeting the high costs of labor and material prevailing throughout the year and after providing for the very heavy taxes and other necessary reserves, etc., amounted to $5,050,849, which represents an average investment for the year of 6%, or $84,600,000.

The unfilled orders of the company at Dec. 31, 1918, after deducting those cancelled or likely to be cancelled by the Government because of the cessation of hostilities, aggregated about $26,265,000, a decrease of $2,491,000 as compared with Dec. 31, 1917. It is probable that the total sales in 1919 will be considerably less than in 1918, although active efforts are being made to stimulate trade and to develop new business.

The additions to the plant of the company during 1918 aggregated $2,925,000, while the increase in reserve for depreciation on the plant was $2,139,000. In addition to providing for the depreciation of the plant, according to its usual and normal practice, the excess cost of construction in process under war conditions over the normal costs to be expected under peace conditions have been charged off.

Although no return from foreign investments are included in the report for 1918, it is believed that the earnings of some of the foreign allied companies were sufficient to offset losses on others, so that no net loss was sustained on the whole. For the purpose of handling the export business of the company to the best advantage, it has been found advisable to segregate it from the domestic business directly connected by this organization. Accordingly, a subsidiary corporation, the International Western Electric Co., Inc., was organized during the year, and has been operating since June 1 with satisfactory results.

A detailed report of earnings of the Western Electric Co., including its subsidiaries, for 12 months ending Dec. 31, 1918, is as follows:

Sales		$145,226,119
Other income		664,919
		$145,891,038
Cost of merchandise	$128,219,691	
Expenses	9,999,965	
Taxes	1,520,533	
Appropriated for:		
Reserve for Employees' Benefit Fund (subsidiary companies)	100,000	
Reserve for contingencies	1,000,000	140,840,189
Available for interest and dividends		$ 5,050,849
Interest paid	1,540,528	
Dividends	3,300,000	
Carried to common stock	210,321	5,050,849
ASSETS.		
Real estate and buildings	$ 13,541,253	
Machinery and equipment	14,430,339	
Total plant		$ 27,971,592
Merchandise	45,047,290	
Cash	5,547,402	
Bills receivable	694,758	
Accounts receivable	23,838,621	
Total current assets		75,128,071
Liberty Bonds		3,904,920
Sundry investments		11,452,316
Grand total		$118,456,899
LIABILITIES.		
Preferred stock, 300,000 shares	$ 30,000,000	
Common stock, 150,000 shares, no par value	25,965,685	
Bonded debt	15,000,000	
Total capital liabilities		70,965,685
General bills payable		10,600,000
Bills payable for Liberty Bonds		2,172,250
Accounts payable		9,710,743
Reserve for depreciation on plant		18,424,058
Reserve for Employees' Benefit Fund		1,600,000
Reserve for contingencies		4,984,163
Grand total		$118,456,899

New York Bank Organizes Industrial Department.

The Liberty National Bank, New York City, has created an industrial department for the purpose of offering its services, in an advisory capacity, on matters pertaining to manufacturing and industrial problems. This new work will be directed by Donald D. Davis, who has had practical engineering, accounting and factory executive experience.

For the Readjustment Period—What?

XXIX.

You Have An Advertising Message—Tell It Now!

Advertising is the certain, quick and economical method of developing your business.

Never were the people—the buying public—more ready and able to buy than they are today.

There is no scarcity of money. The purchasing power in America today is greater than in all history. The field for new and greater business development is here.

When you put the power of advertising promotion and its great economies back of your own business, you are also spreading the spirit of optimism and good-will.

The U. S. Department of Labor urges all progressive manufacturers—in fact, all who have anything to sell—to advertise now and take advantage of the great market which exists at this time.

W. B. WILSON, *Secretary*
U. S. DEPARTMENT OF LABOR.

This message from Secretary Wilson and his associates gives good, sound advice—advice which should be heeded.

C. A. TUPPER *President*
INTERNATIONAL TRADE PRESS, INC., CHICAGO

Dividends.

Directors of the Bell Telephone Co. of Canada have declared a quarterly dividend of 2%, payable April 15 to stock of record March 31.

Electric Securities Co. has declared a quarterly dividend of 2%, payable April 1 to stock of record March 28; also a quarterly dividend of 1¼% on preferred stock, payable May 22 to stock of record April 1.

Illinois Traction Co. has declared a quarterly dividend of 1½% on preferred stock, payable April 1 to stock of record March 15.

Western Union Telegraph Co. has declared a quarterly dividend of 1¾%, payable April 15 to stock of record March 20.

A quarterly dividend of 1¾% has been declared by the Worthington Pump & Machinery Co. on preferred A stock; also a quarterly dividend of 1½% on preferred B stock; both of which are payable April 1 to stock of record March 20.

Benjamin Electric Earnings Gain.

The Benjamin Electric Manufacturing Co., in its annual report shows net profits in 1918 of $434,254, before allowance for federal taxes. This compares with $397,848 before federal taxes in 1917. The sum of $3,248 was deducted for sundry adjustments and $117,558 was distributed in dividends, leaving a balance of $313,448 to be added to surplus, increasing that item to $516,384 on Dec. 31, 1918. The balance sheet at the close of 1918 shows total assets and liabilities of $3,687,674, compared with $2,645,827 on Jan. 2, 1918.

Page Steel & Wire Earnings Show Decrease.

The annual statement of the Page Steel & Wire Co. for 1918 shows net earnings of $261,857, as compared to $323,579 in the previous year. The directors charged off $98,218 for depreciation of inventory values. The balance sheet compares:

ASSETS.	1918.	1917.
Current assets	$2,632,384	$2,601,188
Plants	3,234,255	2,896,025
Franchise, patents and business	1,000,000	1,000,000
Stock in treasury	284,600	284,600
Outside stocks	22,939	.....
Total assets	$7,174,178	$6,781,813
LIABILITIES.		
Current liabilities	$1,946,535	$1,877,488
Capital stock	2,800,000	2,800,000
Bonds	394,000	394,000
Notes	210,800	199,900
Surplus and reserve	1,822,842	1,510,425
Total liabilities	$7,174,178	$6,781,813

Earnings.

PENNSYLVANIA UTILITIES CO.

Statement of operating income for the month of January, 1919 and 1918:

	1919.	1918.
Operating revenues	$160,542	$133,806
Operating expenses and taxes	110,518	107,462
Operating income	$ 50,024	$ 26,344

Statement of operating income for the 12 months ended Jan. 31, 1919 and 1918:

	1919.	1918.
Operating revenues	$1,631,032	$1,256,656
Operating expenses and taxes	1,219,104	1,059,601
Operating income	$ 411,928	$ 197,055

ELECTRIC BOAT CORPORATION.

The report for the year ended Dec. 31, 1918, net income after charges and taxes of $568,525, equal after preferred dividends to $7.09 a share on $4,999,600 common:

	1918.	1917.
Net operating profit	$ 607,573	$2,370,588
Other income	407,400	241,424
Total income	1,014,973	2,612,012
Depreciation, etc.	446,448	531,974
Net income	568,525	2,080,038
Dividends	213,800	1,380,978
Surplus	354,725	699,060

CHICAGO TELEPHONE CO.

For the 12 months to Dec. 31—Gross, $22,433,426; increase, $884,512; net after taxes, $3,269,664; decrease, $288,974. December gross, $1,926,047; increase, $100,287; net after taxes, $114,367; decrease, $215,726.

COLUMBIA GAS & ELECTRIC.

For the year ended Dec. 31, 1918, surplus after taxes and charges was $3,199,198, equivalent to $6.39 a share on $50,000,000 stock, against surplus of $2,933,362, or $5.86 a share in 1917. The income account follows:

	1918.	1917.
Gross earnings	$11,538,772	$10,861,631
Net	7,544,810	7,165,116
Surplus after charges	3,199,198	2,933,362
Dividends	2,000,000	1,500,000
Surplus for year	1,199,198	1,433,362

MANHATTAN ELECTRIC SUPPLY COMPANY'S ANNUAL REPORT.

The company reports net earnings of $525,000 for the year ended Dec. 31, 1918, after setting aside a fund sufficient to meet all taxes. This compares with net of $625,884 earned in 1917. The board of directors has also set aside $206,000 out of 1918 earnings for retirement of its first and second preferred stocks. The sales for the month of January are reported about 66% in excess of the sales for January of last year.

BROOKLYN EDISON CO.

	1918.	1917.	1916.
Total revenue	$ 8,854,302.14	$ 8,381,055.25	$ 8,204,808.66
Expenses including taxes and reserve for property retired	6,162,445.58	5,511,982.25	5,014,050.03
Gross income	$ 2,691,856.56	$ 2,869,073.00	$ 3,190,758.63
Contingencies, reserve	199,620.06	596,704.14	569,174.65
	$ 2,492,236.50	$ 2,272,368.86	$ 2,621,583.98
Interest and discount	$ 898,677.20	$ 802,710.78	$ 761,628.62
Dividends, etc.	1,495,749.88	1,425,522.10	1,293,509.86
Surplus for the year	$ 97,809.42	$ 44,135.98	$ 566,445.50
Adjustments, previous years	.....	59,463.68	*69.83
Credit to profit and loss	$ 97,809.42	$ 103,599.66	$ 566,375.67
Stock outstanding Dec. 31	$17,237,000.00	$17,156,500.00	$15,651,200.00

*Deduction.

CITIES SERVICE CO.

January 31. 1919.

	12 months ending Jan. 31, 1919.	12 months ending Jan. 31, 1918.	Month of Jan., 1919.	Month of Jan., 1918.
Gross earnings	$22,102,203.24	$19,429,505.52	$1,853,598.25	$2,031,462.18
Expenses	552,241.69	366,470.86	61,727.03	30,970.93
Net earnings	$21,549,961.55	$19,063,034.66	$1,791,871.22	$2,000,491.25
Interest on debentures	380,376.64	2,770.48	108,002.35	205.23
Net to stock	$21,169,584.91	$19,060,264.18	$1,683,868.87	$2,000,286.02
Dividends preferred stock	4,041,776.50	3,758,932.15	339,809.50	332,307.50
Net to common stock and reserves	$17,127,808.41	$15,301,332.03	$1,344,059.37	$1,667,978.52
Debenture fund	$ 452,838.98			
Contingent fund	652,029.13			
Stock surplus	1,993,950.21			
Surplus reserve	5,707,208.25			
Surplus	28,677,821.25			
Total surplus and reserves	$37,483,847.82			

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Mar. 11.	Bid Mar. 18.
Adirondack Electric Power of Glens Falls, common	6	12	13
Adirondack Electric Power of Glens Falls, preferred	6	72	73½
American Gas & Electric of New York, common	10+extra	100	100
American Gas & Electric of New York, preferred	6	43	43
American Light & Traction of New York, common	..	243	241
American Light & Traction of New York, preferred	6	98	98½
American Power & Light of New York, common	4	57	60
American Power & Light of New York, preferred	6	77	77
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	7	33	33
American Telephone & Telegraph of New York	..	..	104½
American Water Works & Elec. of New York, common	..	5	6
American Water Works & Elec. of New York, particip	7	8	8
American Water Works & Elec. of New York, first preferred	..	65	65
Appalachian Power, common	..	2½	3
Appalachian Power, preferred	7	..	..
Cities Service of New York, common	+extra	349	345
Cities Service of New York, preferred	6	79¼	79¼
Commonwealth Edison of Chicago	8	113¼	113½
Comm. Power, Railway & Light of Jackson, common	..	18	18
Comm. Power, Railway & Light of Jackson, preferred	6	40	42
Federal Light & Traction of New York, common	..	9	9
Federal Light & Traction of New York, preferred	..	42	42
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	23	25
Middle West Utilities of Chicago, preferred	6	49	49
Northern States Power of Chicago, common	..	70	72
Northern States Power of Chicago, preferred	ex.div.7	90	91
Pacific Gas & Electric of San Francisco, common	..	52	51
Pacific Gas & Electric of San Francisco, preferred	6	..	87
Public Service of Northern Illinois, Chicago, common	7	89	90½
Public Service of Northern Illinois, Chicago, preferred	6	89	89½
Republic Railway & Light of Youngstown, common	4	17	22
Republic Railway & Light of Youngstown, preferred	6	54	58
Standard Gas & Electric of Chicago, common	..	26	24
Standard Gas & Electric of Chicago, preferred	6	40	41⅜
Tennessee Railway, Light & Power of Chattanooga, common	..	4	4½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	17	24
United Light & Railways of Grand Rapids, common	4	36½	39
United Light & Railways of Grand Rapids, preferred	6	70	71
Western Power of San Francisco, common	..	18	18
Western Union Telegraph of New York	extra	88	89
Industries—			
Electric Storage of Philadelphia, common	4	59½	56½
General Electric of Schenectady	8	153⅝	155½
Westinghouse Electric & Mfg. of Pittsburgh, common	7	44⅝	46⅛
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55